WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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VOL. I.—No. 4.] SATURDAY, APRIL 13, 1889. [PRICE ONE PENNY.

HOME-MADE TOOLS.

BY J. H.

I.—AN IRON TRYING PLANE.

INTRODUCTION—PATTERN FOR STOCK—HOW TO MAKE PATTERN—CASTING—TRUEING UP SOLE AND SIDES—FILING—FITTING WOOD BLOCKING—PLANE IRON—FILING MOUTH—WEDGE—POLISHING—LEVER.

IN this series of papers I propose to describe the construction of many of those common tools which, though more or less costly to purchase, amateurs can very well contrive to construct for their own use. There are many such in our workshops — tools which workmen themselves seldom think of purchasing, and which require no very great amount of skill in their construction, but chiefly considerable patience, and much care. I think it well, in the absence of a very strict classification, to divide these tools into four main sections, as follows:—first, planes; second, tools used in measurement; third, miscellaneous tools; fourth, general shop tools. This will be sufficient for our purpose, and in carrying out my plan, as indicated above, I shall keep this arrangement in view and follow it.

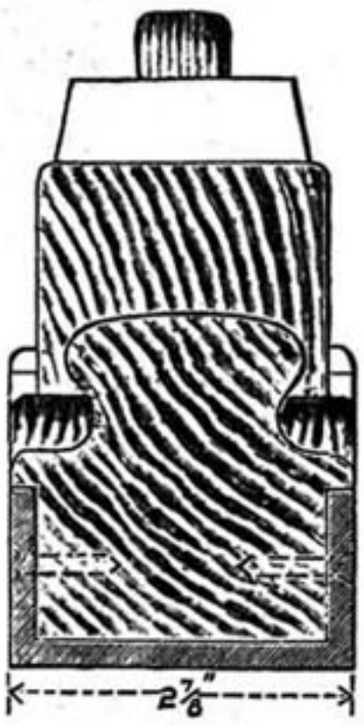

Fig. 2.

Let our first example be an iron trying plane, a tool which no wood worker who aspires to do the very best class of work can well afford to be without. Such a plane costs about thirty shillings in the shops, but it can be made for five shillings.

First, we want a pattern for the stock. This should be made of mahogany, planed very true and free from winding to a thickness of $\frac{7}{16}$ in. bare, say $\frac{1}{2}$ in. bare. But keep the bottom of plane *full* $\frac{3}{16}$ in., to have sufficient metal in case of possible curvature of the casting in cooling.

The shape of the pattern is seen in Figs. 1 and 2. The sides will be nailed on the bottom, perfectly square therewith, and the merest trifle of taper should be given to their inside faces, so that their thickness at the upper edge shall show slack by the callipers, when by comparison they are tight at the bottom edge. This taper is for clean delivery in moulding.

A strip, A, is glued across the inside face of the bottom, just behind the mouth, to form a good bedding for the iron, and also as a shoulder for the abutment of the hinder piece of blocking; and two pieces, B, C, at back and front, to terminate and stiffen the ends, and to act as abutments for the blocking. Two pieces, D, are fitted against the sides to take the resistance of the tightening wedge, if a wedge is used. If a lever is employed no such pieces will be required. These will not be fastened into the pattern, since they would then prevent delivery by pulling up the overlying sand in the mould. They must each be fitted with a vertical sliding dovetail, so that they will be left behind in the mould on the withdrawal of the main pattern. They are taken out subsequently sideways from the mould. Clean the pattern off with fine glass paper, varnish, and rub down.

Fig. 3.

Be careful to take the pattern to a foundry where soft and clean castings are made. A hard, rough casting will be quite useless for the purpose. Stipulate that if the surfaces show blowholes when filed or planed, that the casting shall be replaced free of cost. This precaution is necessary in order to guard against any loss that might otherwise be brought about through the occurrence of a defect of this kind which will sometimes happen in the process of casting.

The most difficult task now follows—that of trueing up the sole and sides of the casting. These, especially the sole, must be straight and free from winding. For use on the shooting board it is also necessary that the sides be truly at right angles therewith.

It will much facilitate matters if a light cut can be taken off all over in the planing machine. But to pay for planing would run up the cost of the plane by about ten shillings. Hence, in most instances, the amateur or cabinet maker will have to true the stock by filing only—not a very severe task after all, provided he is fairly skilful in the use of the file.

Briefly, then, remove the outside hard skin either by grinding, or with an old, nearly worn-out file. Having done so, take a bastard file and go all over the surfaces carefully until they are very approximately level. Their accuracy would be best tested on a fitter's surface plate, supposing the use of one can be obtained. But if not, then a

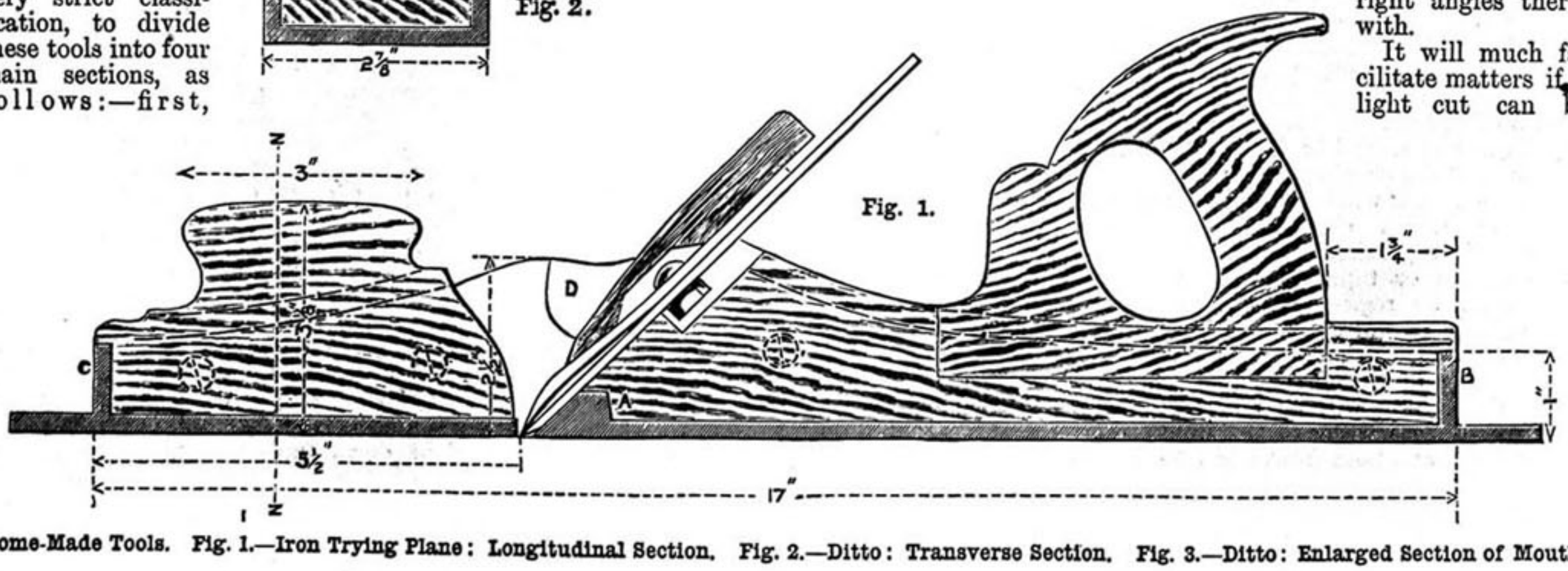

Fig. 1.

Home-Made Tools. Fig. 1.—Iron Trying Plane: Longitudinal Section. Fig. 2.—Ditto: Transverse Section. Fig. 3.—Ditto: Enlarged Section of Mouth.

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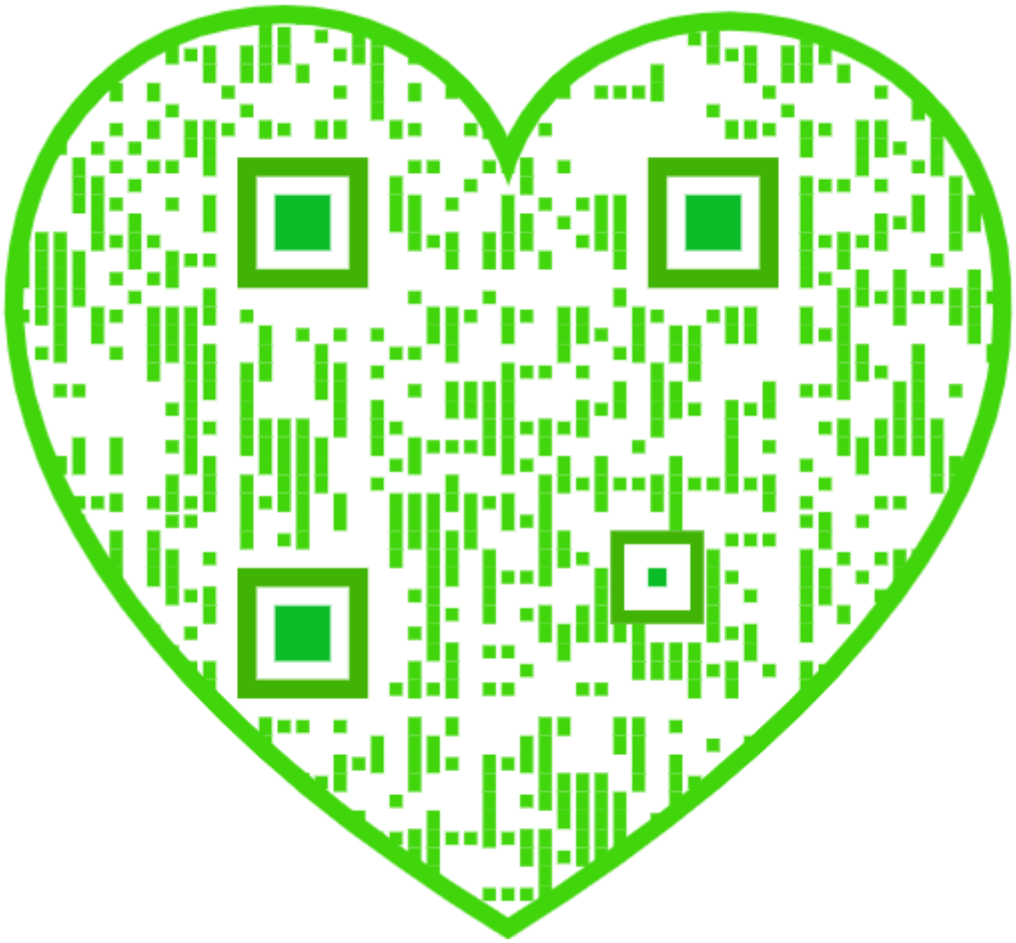

steel straightedge of sufficient length will answer the purpose, trying the plane lengthways, crossways, and diagonally; the latter for winding. It is quite possible to use a very true mahogany straightedge for this purpose if a steel one is not available. As the later stages of filing are approached, the coincidence of the surfaces of the plane and of the surface plate, or straightedge, is carefully tested by smearing a thin film of red lead and oil made to the consistence of thin paste over the plate or straightedge, and observing the extent of its transference to the faces of the plane. Finer files will afterwards be used, finishing with a dead smooth file. Scraping is hardly necessary.

The most troublesome portion of the work is now accomplished. The next task is the fitting of the wood blocking. This blocking may be conveniently made of rosewood, beech, oak, or hard Honduras mahogany. Whatever wood is used it must be perfectly dry. It ought to have lain in the shop under the bench for two or three years at least. Then, being once fitted, there is no reasonable likelihood of shrinkage and splitting occurring.

The pieces may be fitted flush with the inside faces of the sides of the casting, or they may preferably be shouldered over the edges and made flush with the outside faces. The latter plan is shown in Figs. 1 and 2. The fitting of the blocks into the interior and over the edges should be quite finished before the upper outlines are cut. No hard driving must be done, else the iron will probably become broken. Gentle tapping only must be given, and red lead or chalk may be rubbed over the iron to indicate where contact of the blocking occurs. When fitted, drill and countersink four holes in each side to secure the blocks in place permanently with wood screws. The hinder block will have a handle fitted into a mortise recessed therein, and the end which comes next the mouth will be bevelled to an angle of 45° for the bedding of the iron. This bedding face must be very free from winding, else the iron will rock, and so cause the shavings to choke the mouth of the plane. The end of the front block will be bevelled back as shown for the clearance of the shavings.

At this stage it will be desirable to procure the iron, which should properly be a "gauged" or parallel iron, because, unlike the common or tapered iron, its wearing backwards by regrinding does not cause that enlargement of the mouth of the plane which occurs with the tapered iron.

The filing of the mouth, about which I have said nothing, will be undertaken now that we suppose we have the iron bedded on its block, and both front and back blocks screwed in place, as shown. It must be filed, at both back and front edges, perfectly square with the edges of the plane, and with reference to its own iron and wedge, in such a manner that the slightest possible clearance opening for the shavings shall be permitted. See Fig. 3, showing a section of the mouth enlarged. The wedge is fitted at about the same time, the strips, D, being filed underneath to make good contact.

With this, the essential work of the plane is completed, and the cleaning up with glass paper and the polishing only remains. If the wood is of a light colour, staining will improve its appearance. The polishing not only adds to the beauty of the appearance of the tool, but also protects the wood to some extent from atmospheric influence.

The main points, then, to be regarded in the making of this plane are accuracy in the pattern, a soft, clean casting, free from blowholes, the selection of dry, hard wood for the blocking pieces, good fitting of the same, without such severe driving as would tend to break the casting, good bedding of the iron and wedge on its seat, and the most scrupulous nicety in the width of the mouth.

If we elect to use a lever instead of a wedge, the pieces, D, in Fig. 1 are omitted, and the wedge is made of brass, cast from a pattern. It is pivoted, and tightened on the iron by means of a screw of coarse pitch and large, coarsely milled lead.

This method is preferable to the wedge, but involves more work and slightly more expense. In the next article, however, I will describe a smoothing plane fitted in this manner, and therefore give no details of such fitting here.

(To be continued.)

LATHES AND TURNING APPLIANCES.

BY F. A. M.

II.—Introductory (*continued*).—How to Test a Lathe.

There is an enormous difference in the price of lathes of apparently similar design, so that the supposed purchaser I hope to help by these directions is by no means delivered from his perplexities when he has fixed upon the kind or design of lathe he wishes to possess. Why, for instance, should he pay three times as much to one maker as is asked by another? Ask the expensive maker and he will answer, scornfully, he does not wish to enter into competition with such work as that you have mentioned, and that if his men got such a thing in their shop they would quickly "throw it on the scrap heap." Ask the cheap manufacturer wherein the work of the dearer maker surpasses his, and he will descant on the worthlessness of polish and lacquer, and hint at the enormous profits made by some people, till the prospective customer becomes bewildered. Having passed through all these troubles and perplexities I should like, if possible, to help those who are still suffering.

First, then, let me say that, while there is certainly a great deal of real rubbish in the market, you may avoid that if you go to a reputable maker and attend to the following directions. Secondly, it is probable that amongst respectable makers, whether cheap or dear, you will get your money's worth. The profit is not very different with the one or the other, except that if you buy a lathe of which a great many have been made, it will cost a good deal less than if only a few of that kind had been produced, so that it is no doubt true that makers of cheap lathes are contented with less profit than makers of expensive amateurs' lathes, of which only a few are required. Perhaps the reason for the great discrepancy in the price of lathes will appear from the following little story:—An American applied to Henry Maudslay, some years ago, for an accurate screw some three feet long, expressing himself, naturally, with great emphasis on the high degree of perfection required. The screw was made, but what was the horror of the American when he found the cost was to be £100! He refused to pay, and a commission of experts was appointed to report upon the matter, and decide the true value of the screw. To them Maudslay explained the process of manufacture, the precautions taken to ensure accuracy, and the several methods for correction employed, when they decided that the charge was not excessive and the whole amount must be paid. Let us hope the American was consoled by the thought he could at any rate say he had a screw that would "lick creation." Now suppose that screw had been cut up in a tapping machine (as I am told the leading screws of some of the cheapest slide lathes are treated), and what would have been its value? Five shillings, perhaps! This story is given from memory, not as history, but because I hope it may explain wherein lies the difference between an expensive lathe by one of our best makers and a cheap one. Lay the five shilling screw beside the £100 one and, except for a little extra finish, you might not be able to tell them apart; but, if tested by the microscope or measuring machine, the thread of the good screw would be found to advance regularly by an equal distance each turn, not varying by the one-thousandth part of an inch, and it would be the parent of other screws almost equally correct, whilst the cheap screw would be afflicted with drunkenness; the thread would advance too fast or too slowly, and every screw cut by its means would partake of the same faults. An expensive lathe surpasses a cheap one in *finish*. True, but that is of small consequence. It surpasses it in *exactness of fitting* of the slides and other parts—this is important. It surpasses it in *durability*, which is most desirable; but chiefest of all it surpasses it in *accuracy of adjustment*. The true value of a lathe cannot be estimated until, besides its design and general arrangement, all these four qualities have been considered.

Before proceeding to show what kind of accuracy is required and how a lathe may be tested, it may help if I give a piece of experience with that same boy's lathe referred to at the beginning of this paper. It had certain serious faults of design and construction which will serve as examples in introducing the subject. These faults did not become apparent at first, but when the boy turner grew older he became somewhat disgusted with what had at first seemed absolute perfection. The first fault to be discovered was that when a long piece of work had to be hollowed out, such as a deep cup, and had been chucked by one end on the "taper-screw" chuck, the back-centre point could not be brought up to support the end while the outside was turned. If this was attempted, the point, instead of entering the little central hole made for it with the corner of a chisel, would scratch a circle round that hole of about ¼-in. in diameter. By degrees it dawned upon the mind that this was not a necessity but a fault of construction; the centre line of the mandrel did not point straight down the bed, but only met the point of the back-centre when this was brought close up to the "live" or "running" centre. Here then is an important point in lathe construction: the holes through the two headstocks must be in one straight line, and that straight line must be parallel with the bed, so that, if these holes were of the same size, the headstocks might be clamped upon the bed in any position, and a bar fitting the holes might be passed through both.

My readers will now understand more easily how they may test a lathe and try its accuracy. Take the *plain lathe* first, and begin with the moving headstock. Loosen the holding-down bolt and slide it on the bed, from end to end, to see that it moves freely—it is pretty sure to do so; now try whether it is at all loose; put both hands on it, front and back, and pull and push alternately, listening for a little knock that would prove the tenon underneath did not perfectly fill

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the space between the bed; slide it along to another place and try again. If there is a decided knock at any part of the bed, so that you can see the point of the back-centre makes a little movement across the bed, the lathe may do for wood turning, or, if fitted with slide rest and the knock is not much, it will do for metal; but it would not do for accurate work as a slide lathe because its centre line does not preserve any certain direction. Suppose, however, that you are satisfied with the fit of the moving headstock, you should next make sure that the cylinder of the headstock that holds the back-centre point fits, and slides in and out without shake; screw it half-way out, push forward the headstock and fix the holding-down bolt so that the point of the back-centre almost touches that of the running-centre; take the back-centre point in your fingers and, without having fixed the pinching screw of the cylinder, try to displace its point. If the cylinder fits the headstock and the centre-point the cylinder, it will feel quite firm, but if it is loose its proximity to the other centre-point will show how much it moves. The next thing to ascertain, since the cylinder of the poppet or headstock has a fixed direction, is whether that is the correct one? Screw out the back-centre point until it begins to feel loose, fix it with the pinching screw, and slide up the headstock till the centres meet. Now observe very carefully whether they come together exactly, looking at them from above and then from the side; if they do so, screw in the cylinder as far as it will go, move up the points to touch, fix the pinching screw, and look again. If they still correspond, the moving headstock is true, but it requires a trained eye to detect slight divergencies.

We may now turn our attention to the fixed headstock; its accuracy is even more important than that of the movable one. Usually there is a hole in the front end of the mandrel into which the running-centre fits, but in small lathes this centre forms part of a chuck which screws upon the mandrel. Now this hole is usually turned out, by a tool fixed in the slide rest, to a cone, each side of which is about 1°, so that the two sides of the cone would form with each other an angle of 2°. It appears to be almost impossible to get this hole perfectly true. To test it, wipe it out carefully; wipe the centre and press it firmly in; now turn the lathe rapidly and bring the point of a tool very carefully forward to touch the end of the revolving centre, when it is almost certain to be found slightly out of truth; turn the centre round to several positions in the mandrel and try again till you find the position in which it seems to run truly. Mark both it and the mandrel so that you can put it in always the same way, then turn the centre half round in the mandrel—*i.e.*, to its worst position—and observe how far from truth it is. You can measure this error approximately by bringing up the corner of the hand rest till it just touches the end of the revolving centre; then turn it half round from the touching point, when the distance between the two will be the greatest. Try first to slip in a piece of newspaper; if that will go, double it and try again. The *Times* paper is about $\frac{1}{1000}$ of an inch thick, say $\frac{1}{200}$, so that if you can get in two thicknesses, as is very probable, the point of the running-centre, instead of running truly, is describing a circle having a radius of $\frac{1}{50}$ of an inch. In such a case as this the hole should be very carefully re-bored. Next proceed to take out the mandrel and examine the rubbing surfaces, both inside and outside, to see that they are perfectly hard, smooth, and evenly polished, showing that they touch all over. If the mandrel be fitted with a back-centre, it should pass through a plain, not a screwed, hole, which hole should point straight to the centre of the collar. To ascertain whether it does so, take out the back-centre, turn up a roller of wood to fit the hole, and, passing it through the back-centre hole from the left as far as the hole in the collar, look whether it takes up a position in the middle of that hole. If this were not the case, advancing the back-centre point to take up any wear of the wearing surfaces would throw the mandrel out of line with the lathe bed and cause it to jam in its collar. The last and most important point to examine, is, whether the centre line of the mandrel is in one straight line with the centre line of the moving headstock, and parallel with the bed. Begin, as with the moving headstock, by releasing the holding-down bolt and trying whether you can twist it sideways on the bed; if it prove loose, it may come true if pressed against one or other side of the opening in the bed, but this would be a bad fault. Supposing it is tight, and remembering that you have already satisfied yourself that the point of the running-centre corresponds with that of the fixed or "dead" centre, therefore *one* point of the centre line of the mandrel is right; but we must also ascertain that a *second* point in this central line is true before we shall know that the heads are in line. To ascertain this, prolong the mandrel by fixing a roller of wood in a chuck; let the wood be about 12 or 18 in. long, and melt a little wax on the end of it. Now, while the wood is revolving in the lathe, bring up the point of the back-centre to touch the wax; if the lathe is true it will make a dot; if it is tolerably true, a circle which will be small—say $\frac{1}{32}$ in. in diameter; but if the circle be $\frac{1}{4}$ in. or more, the lathe is not fit for boring, nor for accurate work, unless it can be adjusted. This last test is easily applied, and is more likely than any other to show whether the lathe has been conscientiously made. Now, since it is only a plain lathe we are testing, you can conclude by putting on the band, so as to give eight turns of the mandrel to one of the crank, and, after oiling all the centres and bearings, run the lathe by the foot, to try whether at that speed it goes easily and continues turning some little time after you take off your foot.

We come now to the *slide* lathe fitted with a long leading screw and a saddle to carry the slide rest. All the foregoing tests must be tried for this class of lathe, and that with additional care; besides these, we must test whether the lathe is true enough to turn up a face-plate quite flat, and to slide up a shaft parallel. Take the largest face-plate supplied with the lathe and try, with a straightedge laid across, whether it is perfectly flat; then screw it on, after carefully wiping the screw threads and faces of the chuck and mandrel. Put a point tool in the rest and bring it up carefully to the revolving plate, to try whether it is perfectly true. Let the tool be so fixed in the rest that, when the cross-slide of the saddle is fully drawn back, the tool will point to the face of the plate close to the outer edge. Adjust its distance from the plate till you can just get a card or a bit of paper in between the two; then screw the slide forward till the tool point is opposite the inner edge of the plate near the hole where the end of the mandrel nose appears, and try with the card or paper again. The last test is the one for parallel turning. Wipe the holes for the centres and put them in, taking care that the running-centre is true. Then take a bar about an inch in diameter, as long, or nearly as long, as the lathe will take in; centre it, and, putting it in the lathe, turn up about an inch at one end; then, after adjusting the tool point till it just touches the turned part, take off the handles of the slide rest, take the bar out from between the centres, rack the saddle to the left till the tool point comes opposite the running-centre, turn the bar end for end, and put it between the centres again. Now gently rack the saddle to the right to bring the tool point on to the turned end, and see whether it touches it just as it did at the other end. If you can get a bit of paper between, it would not be very bad, as the test is a severe one, but every thickness of paper you can get in detracts from the value of the lathe.

There are usually screws put through the tenon of the fixed headstock of an engineer's slide lathe, which screws afford means of adjustment; but it must be remembered that it will not do to move these screws to suit any *one* of these tests, since by so doing the adjustment would be thrown out in other directions.

I trust my readers will not have been puzzled by the foregoing attempt at explaining how lathes can be tested. If they will follow out my directions in testing their own, or a friend's lathe, they will, I think, obtain a considerable insight into the principles of lathe work which will be useful to them afterwards, and they will at any rate perceive that the value of a lathe lies not in its appearance but in its accuracy; also that if they buy a cheap lathe it may content them pretty well, for a time, till they become better workmen, and then they are sure to become dissatisfied, so that the quality of lathe they buy might well be made to depend upon the perfection of workmanship to which they mean to attain.

I will now redeem my promise to name some books on Turning, smaller and cheaper than Holtzappfel's voluminous work.

Mr. J. H. Evans has written and published a book on "Ornamental Turning" only, at 21s., which is very good.

Next to this comes "Lathes and Turning," by W. H. Northcott, of the London Lathe and Tool Company; it costs 18s., and covers the whole ground of plain and complex turning. I recommend my readers to buy that book, and to inspect the lathes and tools made at Pomeroy Street.

"The Lathe and its Uses," by the Rev. J. Lukin, costs 10s. 6d.; it contains matter not comprised in other books, but is rather marred by some bad engravings.

After these come a number of smaller books, such as "Lathe Work," by P. N. Hasluck, price 5s., and "Turning for Amateurs," an elementary work well suited for beginners, by the Rev. J. Lukin, 3s.

(*To be continued.*)

A SIMPLE CEILING IN WOOD.

With Hints for Wall Panelling on the Same Plan.

BY HIRAM PRICE.

II.—Panelled Ceilings and Walls.

In my former part I confined myself to speaking only of simple longitudinal arrangements of mouldings which followed the direction of the joists. By such means what may be called a handsome ceiling can

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be formed with little labour. But far greater decorative results are to be obtained by the additional employment of transverse or even of diagonal mouldings. I have myself attempted something in this direction in the small entrance hall—or, rather, the vestibule to the hall—of my house. The arrangement there carried out is shown in Fig. 5. The lines of the real joists, A, A, are crossed by imitation joists, B, B, which latter are for effect only, and form no part of the construction. The real joists rest on a projecting ornamental brick moulding of the walls, C, C—the walls themselves in this vestibule being, as was hinted in Chapter I., of uncovered but carefully finished brickwork. In this ceiling the four compartments are of course alike, but in the illustration I have (for economy of space, that I may furnish as many suggestions as possible) shown how four different patterns may be formed by the addition of some little moulding or turned work.

By using mouldings crossing diagonally, we may attain truly elaborate effects, nearly approaching in richness to the "artesonado" ceilings of Spain. Some partial idea of the appearance of these may be gained from Fig. 6, which shows one repeating compartment of a ceiling of the kind, sketched by myself, at the Café del Comercio, Murcia, the house having formerly been the mansion of a "Condé." Rich ceilings are an important feature in Spanish domestic architecture. One learns there to expect them, and to feel some disgust when remembering the poverty of our own ceilings at home. It was during a residence in Eastern Spain that I conceived the idea of trying something of the sort myself whenever I should build in England.

The joists used by Spanish builders are much thicker than those commonly used in this country. Those seen in the illustration (Fig. 6) are probably cut half through at their intersections, and still have sufficient strength left to carry the heavy quarry floor above them.

From what has already been said, it will be seen that any one with but a limited knowledge of the joiner's craft could put up a wooden ceiling like mine. No very accurate workmanship is required—a mere dabbler in carpentry could do it. And for that reason I would suggest that any person who may wish to panel a room with his own hands, and who has not the skill or tools to carry out the work in the orthodox fashion, should proceed on somewhat similar lines.

Had I the panelling of a room before me, this would be my way of setting to work. I should first surround my room with two horizontal bands of lath, one at the top and the other at the bottom of the walls; and between these, at proper intervals, I should fix upright laths, which might be said to represent the joists in a panelled ceiling. That the laths might be perfectly firm, it would be well to drive wooden plugs into the walls to which to nail them; the uprights must be in plumb and fixed at equal distances apart, those distances to depend on the width of the veneering boards employed.

My next proceeding would be to screw veneering boards to the vertical laths—two boards to each alternate lath, back to back. They would be fixed by one edge only, the other edge merely lying loose on the intermediate lath. Space would be left between each two boards to give room for expansion, as it was in the ceiling; these spaces to be afterwards hidden, as then, by mouldings laid over them. In Fig. 7 I have drawn a section of panelling thus arranged. The line, A, A, shows the surface of the wall; B, B, B, are the upright laths; C, C, C, are the veneering boards, which for wall panelling should be somewhat stouter than for ceiling work, say ¾ in. instead of ½ in.; and D, D, D, are the mouldings.

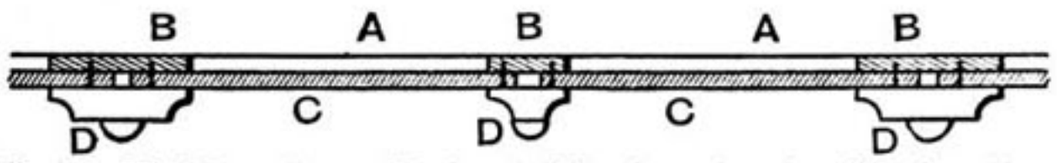

Fig. 7.—Wall Panelling. Horizontal Section, showing Construction.

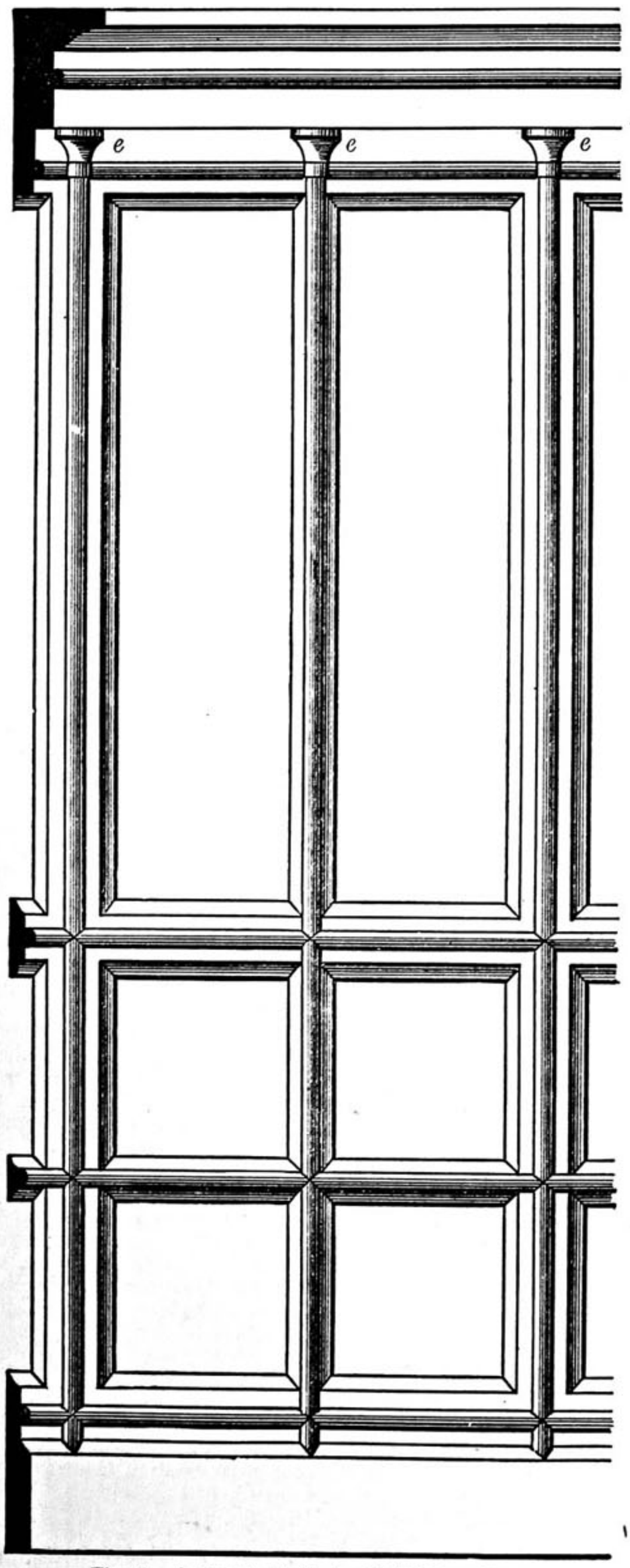

Fig. 8.—A Simple Method of Wall Panelling.

In Fig. 8 I have shown some of this panelling in a completed state. It will be seen that it is finished above by a cornice, which is supposed to be composed entirely of wood mouldings. The small capitals at *e*, *e*, *e*, are turned and then sawn in half; but a worker who has no lathe, but who can carve, might make a richer cornice with carved caps. In the lower part of the panelling I have indicated an arrangement of cross pieces which form a kind of dado, and not an unsightly one.

When panelling walls on this system, it will, I think, be found desirable, for the sake of effect, to keep the longitudinal divisions wider apart than in panelling ceilings. Were I dealing with a room to which I had made a ceiling of this kind, I should, if possible, get my veneering boards 13 in. wide, so that I might arrange to bring one of my larger upright mouldings under each alternate joist only, and one of my smaller uprights under the intermediate joists; for, taken with the ribbed ceiling, the walls would otherwise look too much cut up and crowded. If, however, I were panelling a room with an ordinary plaster ceiling, I should fear no such danger, and make my veneering boards — or panels, if you will—of the more usual 11 in. stuff.

Not much bench work is called for in the construction of these ceilings and wall panellings. Cutting to length, fitting, and fixing up, is nearly all that has to be done. All the stuff can be bought ready prepared. The veneering boards will be bought ready planed on one side; and steam-struck mouldings, which can be bought far more cheaply than such mouldings could be worked at home, will of course be used. The principal firms who sell such things issue price lists which show full-sized sections of a sufficient variety of mouldings, and these may be had at prices ranging from a couple of shillings to as many pounds for the hundred feet run. The wood in which they seem to be usually kept in stock is yellow pine. Such a moulding as that needed for the large upright in Figs. 7 and 8 (width, 2 in.; projection, ¾ of an inch) would cost about 7s. 6d. That required for the smaller uprights would be proportionately less. For wall panelling a *separate* circular bead down the centre of the moulding is not recommended. Needle points would scarcely be strong enough to hold it in place in such a situation; it would be better to have the moulding all in one piece. It will be necessary to screw

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through the centre, but the holes can be countersunk so as to let the heads well in, and they can be puttied over and coloured like the surrounding wood work. But for where such round beadings are wanted in ceilings (as at *e*, Figs. 1 and 2), they may be had of various diameters, from ⅜ of an in. to 2 in., at prices from about 3s. to 16s. The top of the cornice, Fig. 7, will need a heavier and bolder moulding. I purchased one that is very effective for such a purpose, which shows a projection of nearly 3 in., for about 25s.

I may mention that I got my mouldings from Messrs. Joseph Sandel and Co., Waterloo Bridge Road, Lambeth, S.E., London. I found them quite satisfactory: good material and little waste.

Whilst speaking of these mouldings I may suggest another way in which they may be made serviceable in home-made house fittings. One of my friends bought an old-fashioned house in which none of the rooms had any cornices beneath the ceilings. My friend was of a mechanical turn like myself, and proposed to decorate his house with his own hands—and a little help from me. We all know how mean and unfinished a room looks with no cornice, and to remedy the defect we got some of these steam-struck pine mouldings, of three or four different patterns. We ebonised them with decoction of logwood and solution of iron, and polished them with beeswax and turpentine. This is quickly done with mere narrow strips of moulding, and after we had papered the walls we nailed up these mouldings in place of cornices. They look very well; the black line between wall and ceiling has a good effect, more especialy if the prevailing colour of the wall paper is green or red.

But in two rooms we did something more than this. In one—the dining-room—we used a large moulding of some 2½ in. in depth and projection, which had a deep rounded hollow running along its centre. We cut from pine board a quantity of square ornaments, something like the "dog's tooth" at *d*, Fig. 5, gilded them, and fitted them into this hollow at intervals of about a foot. This had a very handsome effect. In the other room we used *two* bands of moulding, one (1½ in. wide) against the ceiling, and a second (¾ of an in. wide) a foot below, thus forming a frieze round the room. The paper of the lower walls was green, that between the mouldings crimson and maroon. This, too, was successful.

This was not very costly work apart from the trouble, for a hundred feet of moulding go a long way (they will cornice a room 25 feet square), and some of the moulding which we used did not cost more than 3s. 6d. a hundred. To return to my wooden ceiling. I would mention one especial advantage which I find it to possess over a ceiling of plaster—it does not require the periodical nuisance of white-washing.

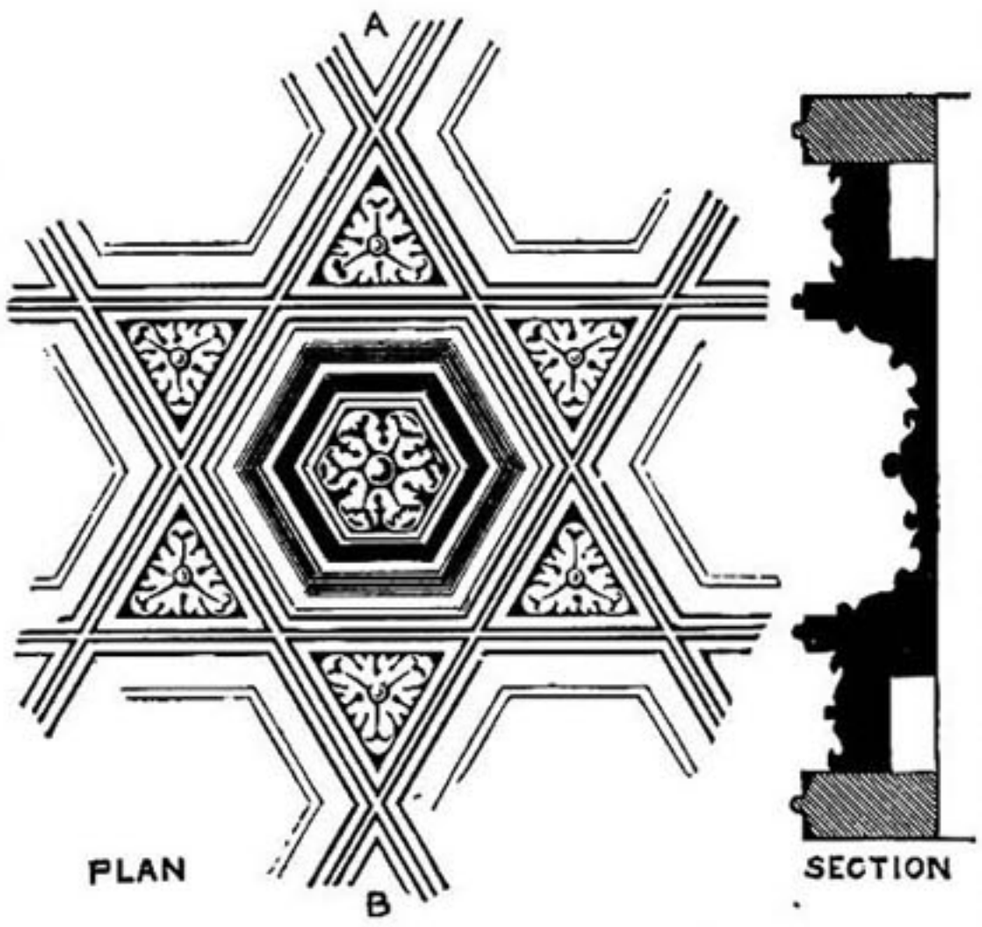

Fig. 6.—Single Compartment in Plan, and Section along A, B, in Plan. Café del Comercio, Murcia, Spain.

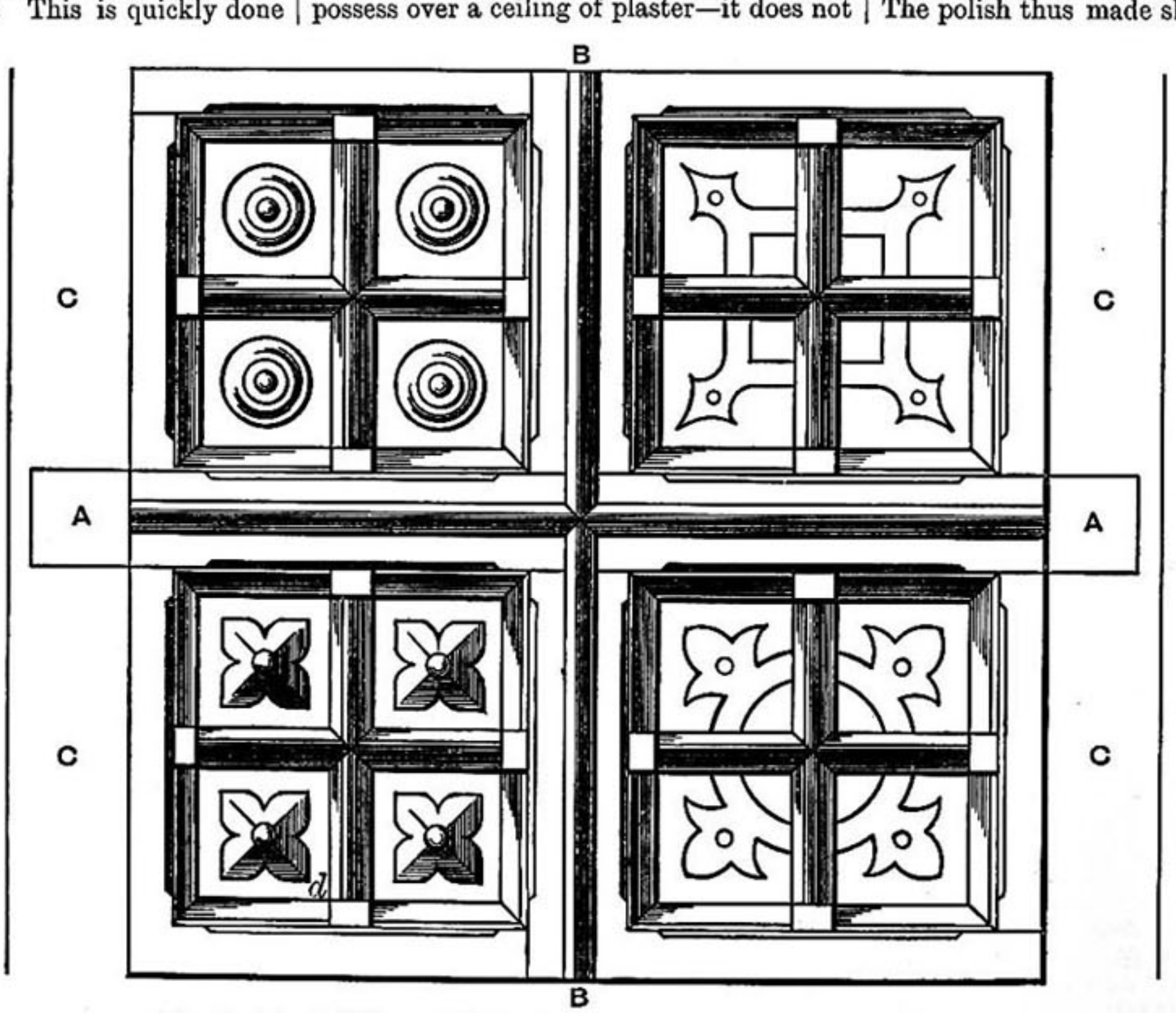

Fig. 5.—Wood Ceiling of Hall, with Four Alternative Designs for Panels.

On looking over the above, it appears to me desirable that in the matter of ebonising some more particular directions should be given; for not only is that process applicable, as above remarked, to cornice mouldings, but it might well be employed both in our ceilings and panellings upon projecting central beadings, etc., if an attempt were made to produce a decorative effect by staining the wood work of different shades.

The process of ebonising is of such simplicity, that any one with moderate care can do it successfully. My plan is to boil the logwood chips in an earthen pipkin, till I have a decoction sufficiently strong to show of a deep orange-red colour, wherever it is laid on the pine wood. This I brush over the wood whilst quite hot, and I go over it twice in order that no part may be missed. In a few minutes the wood is fit to receive the solution of iron, which I also brush on hot and apply twice over. I make my solution by dissolving any odd scraps of iron in vinegar, and dilute it before using with about half water. The wood when touched by the iron at once turns to a deep black, but with rather a purple tinge; this tinge, however, disappears with polishing. Before the polish is applied, the wood should remain for a night to get thoroughly dry, and thin boards, or anything liable to warp, should be weighted. The polishing, as mentioned above, is done with beeswax and turpentine. Pouring some turpentine into a saucer, I scrape into it as much wax as it will moisten freely, and then place the saucer near enough to the fire to melt the wax; but this needs care, as the mixture is highly inflammable. The polish thus made should be of the consistency of cream. It has to be applied with a hard brush and hard brushing; a little of the mixture and a liberal amount of brisk rubbing is the way to get a brilliant polish.

It is, however, rather for cabinet work that great brilliancy becomes a desideratum. For the purpose that we have before us—the ebonising of mere mouldings for our cornices, ceilings, or wall panellings—no higher polish is needed than is to be attained with a very moderate amount of rubbing.

I trust that the hints I have thrown out in this and the preceding paper on the treatment of ceilings will be found useful by many, and such as they may adopt with advantage. Generally speaking, the ceiling in rooms in English houses offers a wide expanse of whitened surface to the view utterly devoid of ornamentation. The only excuse for the invariable whiteness lies in the additional light that is gained by reflection from the ceiling. This would not be materially lessened by the adoption of a warmer tint or stencilled bordering.

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FRIENDLY HINTS TO AMATEUR WOOD WORKERS.

BY DAVID DENNING.

I.—Difficulties of Amateurs—Matters often Overlooked—Unseasoned Wood—How to Season it—Warping or Casting—Why Wood should be Turned when Drying—Casting of Dry Wood—How to Distinguish Seasoned Wood—Sources of Supply—Making Glue—Appearance of Good Glue—Fracture of Glue a Test of Quality—Soaking Glue—The Glue-Pot—Melting Glue—Gluing up—How to Use Glue.

Few who have paid any attention to amateur workers' productions can have failed to notice the difference between them and those of the professional; and without any desire to disparage the former, it can seldom be said that they surpass the latter in those points by which superiority is determined. Even where they are not actually faulty either from carelessness or want of knowledge in some constructive detail, there is, if one may so call it, a want of breadth, a niggling kind of work, which proclaims the more or less unskilful artisan. It is, of course, not to be expected that the amateur can have acquired the same facility in working with the tools of any craft as the professional worker who spends a great portion of his life in handling them. In any special pursuit the latter has undoubted advantages not only by seeing how others work, but from constant opportunity of acquiring the manual dexterity which can only be the outcome of practice. The amateur seldom has opportunity of watching skilled craftsmen at work, but must to a great extent depend on what he can pick up by reading, with, perhaps, an ocular demonstration now and again by some friendly expert. True, the sources of his information are now much more accessible, so far as books are concerned, than they were a few years ago, but for all that he must rely to a great extent on his own versatility and ingenuity as well as on his power to "read between the lines" of any technical book or article he may be studying; for, speaking for myself—and I imagine the experience of other technical writers is not dissimilar—it is impossible to convey often what one feels must be necessary information to the novice in any particular branch of work. One may do one's best with pen and ink, both verbally and with illustration, but nothing can equal practical demonstration; and it is much to the credit of those who, without special opportunities of acquiring skill and knowledge of modes of working, have worked so assiduously that they can produce anything worth looking at.

Now, with this little preamble, which, it is hoped, no amateur will take amiss, or regard in any way as intending to discourage him or decry his efforts, I should like to mention a few matters in connection with amateur joinery or cabinet work, merely premising that though I am not an amateur at this, I am in other mechanical pursuits, so that the difficulties to be encountered by the amateur in it may fairly be taken as understood by analogy by the writer. Let me then point out to you, my amateur wood-working readers, a few little matters the neglect of which is often a source of blemish or weakness in your productions. I do so in all friendliness, and I trust that none will object to the remarks. I do not intend to perplex you with complicated technicology, or the insistence of hard-and-fast lines of working, but rather to reiterate those principles which, though well known and perhaps obvious, are apt to be overlooked in actual practice by those who are not continually putting them into operation.

First of all may be taken into consideration the material—wood—not so much with regard to kind of timber or quality of figure and those other features which give to the various sorts their value, as to wood that is fit for working. Now, I suppose every one knows that wood ought to be thoroughly seasoned before it can be prudently made up. If it is not, there is little chance of anything made from it being satisfactory; but it must not be forgotten that even thoroughly seasoned wood may not be dry enough for use. It is too often thought that if wood is seasoned nothing more is necessary, hence the complaints one so frequently hears of the difficulty in obtaining seasoned stuff. As a rule, however, there is no difficulty in obtaining well-seasoned boards of the ordinary kind of timber in any of the larger towns, but *dryness* is another matter altogether. How can it be expected that timber which has been exposed to all weathers, or at the most has only been covered on top, can in our climate be thoroughly dry? Well, when you get wood from the yard do not work it up at once, but let it stand awhile—it may be for days or weeks or only hours—in some warm, dry place before using it. There will then be fewer complaints of "unseasoned" wood having been supplied. Unless wood is thoroughly dry it is bound to shrink when made up, and unless due allowance has been made for this shrinkage it will certainly split.

Again, it is useful to note during the drying process, even while in the rough, boards are apt to cast or twist, or, in untechnical words, to become uneven, some woods being much more prone to this bad habit than others. As a rule, those with straight, even grain, like American walnut or Honduras mahogany, are more reliable than those with finely-marked, elaborate figuring, such as pollard oak, which is a timber that requires the utmost care if used in the solid. It twists and casts in a manner which would surprise any one unaccustomed to its vagaries. Whatever the wood is, planks should be turned occasionally when drying, unless there is an equal air space on each side, for if they are laid on the floor, or leaning against a wall, it will very likely be found that they become rounded, or convex on one side and correspondingly concave on the other. This is owing to the wood becoming either dryer on the concave side or absorbing moisture on the other.

As an effective illustration of this, take a piece of thin board—any will do for the purpose—and leave it in some damp place for a few days, or wet it well on both sides, allowing the water to soak in. If both sides be equally wet, the wood will remain level, but if damper on one side than the other, it will swell on that side. When the moisture has soaked in, hold one side to the fire and just watch how the wood curls. Hold the other side to the fire, and the board curls over in the opposite direction. If while the wood is wet—*i.e.*, after the water has soaked in thoroughly—it be nailed to a dry piece the grain of which runs transversely, in order that the experiment may be better tried, and then held to the fire, the wood, instead of bending, which it will be unable to do, owing to the rigidity of the board to which it is fastened, will, as it dries, naturally contract, and the chances are, will split. Of course, in nailing it down the nails must be put in near the edges, for were it just fastened by one or two in the centre, it would merely contract from the edges to this. Now, the heat of the fire merely accelerates the natural process, the movements in the boards being the same, whether the drying process takes months or minutes, so we see pretty well what course must be adopted if we wish to have good workable stuff free from "shakes"—*i.e.*, without cracks, and flat.

Sometimes the wood worker will find, whatever precautions are taken, that the wood will cast, and if it is really dry and the defect is only slight, it may be rectified by laying the board, hollow side downwards, on a cold floor, and leaving it for a time, or by exposing the convex side to the heat of a fire. In either case watchfulness is necessary to prevent the curve forming the reverse way. Very thin wood may often be flattened by simply placing it under weights, but this process is not altogether to be depended on. When boards are very badly cast and twisted, the only reliable way to level them, with any degree of certainty that they will remain so, is to plane them down. Please note, nothing has been said about unseasoned wood being dried, for it is assumed that every precaution will be taken to use only that which is seasoned; but to sum up, take equal precaution to see that it is *dry*. If this be attended to, most of the defects commonly—and no doubt often correctly—attributed to unseasoned wood will be found non-existent.

Perhaps it may be thought by some of my readers that something should be said about distinguishing when wood is seasoned or not. Much might be written about this, but after all it would simply amount to saying that experience is the best and almost the only guide. A fair idea may often be gathered by noticing the weather stains, but as these depend to a great extent on where and how the timber has been stored, unless the buyer is well acquainted with the material they are not to be regarded as "a fixed quantity," but rather as the unknown X of algebraists. It is true that to the experienced eye weather stains often indicate much, and where they are very marked the wood will generally be at least fairly seasoned—not necessarily dry, mind—but it will frequently be found that thoroughly seasoned wood has little or no stain. Hence the difficulty of giving reliable data on this score.

As a sound and indisputable general rule for the amateur to follow, the best advice that can be given him is to buy from reliable dealers only, and to put confidence in their judgment. As for the sources whence the amateur can draw his supply, it may be said that timber merchants' yards seem the most natural, especially for the coarser kinds of woods, but it stands to reason that many of them will not cut planks nor allow their stock to be turned over for selection when the purchase is only a small one. When there is any difficulty in getting suitable stuff in small quantities from timber yards, cabinet makers who actually make furniture—many of them do not—can generally be applied to with success; only as the bulk of the wood they use is selected for the purpose of furniture making, and therefore often above the average quality of that found in a builder's timber-yard, prices are proportionately higher. Speaking roughly, wood at very low prices generally means wood of inferior quality. Amateurs have been known to complain of one-inch thick

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mahogany at one shilling per foot being dear, but what would such say to mahogany in veneers at three to four shillings per foot? Yet possibly any of these figures might indicate better value than some mahogany at only sixpence per foot.

With this the remarks on timber must be concluded for the present, and a little may be said about another matter of almost equal importance to the wood worker—viz., glue and its application.

The mixing, or in colloquial language the "making," of glue is one of those little matters which the amateur sometimes seems to think will take care of themselves. No more serious mistake could be made, for glue must not only be good before it is made, but it must be made properly, neither too thick nor too thin, and when this has been satisfactorily arranged, it must be properly used. Any one can stick two pieces of wood together with glue, but whether the joint will be clumsy or neat, durable or only of a temporary character, depends almost entirely on the care and ability with which it has been made. Given good glue rightly mixed and used, the joint, say between two boards, may be so strong that it will be easier to break the wood than to separate the pieces where they are joined.

To begin with the raw material, the glue in the cake as sold in the shops, a few hints may be given which will be of service to the novice, to whom, however, it would be useless to give those finer distinctions and tests by which an expert in glue may fairly estimate its quality. The slightest observation will have shown any one who knows what glue is that there are very marked differences in colour in different makes. Some are almost black except when viewed by transmitted light, while some are almost like amber or gelatine in colour and transparency. Neither extreme is good where strength of joint is a primary object. The black, opaque, unclean-looking stuff proclaims its quality sufficiently even if retail prices do not indicate to the buyer that he can hardly expect much at considerably less than the best qualities are sold for in bulk. The very light-coloured glue is often fairly good and of medium price, but the bleaching to which it is subjected in order to obtain the captivating, and at the same time unnatural, transparency and light colour sometimes impairs its tenacity. For some purposes, such as gluing down thin, light-coloured veneers, it is very good, simply because it does not darken the tone of the wood, as some consider the darker glue does. This, however, may as a moot point be almost considered as beyond the amateur's ken. It is very seldom such extremely delicate veneer is used as to necessitate colourless glue, much of which, if not all, is of continental origin by the way. Those who are familiar with many Teutonic and Gallic productions will understand that they are often excellent imitations of English productions of the same type, but that after all there is something not quite right about them. So it is with glue. I have at various times tested, or had tested, many samples of continental glues which were nice to look at and offered at tempting prices by plausible German bagmen, but I never met with a sample which could be compared with the best British glue for strength and economy in use. I say *British* advisedly, for the best glue for general purposes is Scotch, and it is worthy of every care and attention that the worker can bestow. In colour it is a clear, wholesome, ruddy brown, not a muddy-looking compound, nor yet refined to gelatine.

The manner in which glue breaks when struck, or rather the appearance of the fractured edges, is often a good indication, as is likewise the feel when it is held or rubbed between a moistened finger and thumb; but to go fully into these details would give a quite too technical character to these hints. It will be more within their scope to give a few directions for mixing now that a few leading qualifications of good glue have been indicated, and in doing so it will be seen that there are other points to be observed.

The first thing in making glue is to break the cakes into pieces of moderate size. If the glue shivers easily like a piece of glass would do it may be looked on as too brittle to be perfect, and *per contra* it should not be tough and leathery. Any way, the pieces must be covered with cold water and allowed to remain in soak till they are soft. Mind, good glue should not dissolve in cold water; it should merely swell up and soften. If the water dissolves it as it soaks in and does not seem to penetrate to more than a slight depth there is something wrong. The quantity of water which glue will absorb is a fairly correct estimate of its value being arrived at. Roughly speaking, a glue which will absorb more water than another is the preferable of the two.

When the glue is thoroughly softened by soaking in water it must be liquefied by heat in an ordinary glue-pot, the general features of which are too well known to call for any remark. With regard to size, however, it may be said that a large pot does not require heating so frequently as a small one, which naturally chills more quickly. This leads me on to say that glue should always be used as hot as possible, merely warm enough to be sticky will not do, it must be as hot as it can be made. With the outer pot kept well supplied with water it is not possible to burn the glue, and it is to prevent this that a double pot is required. In its absence a very good substitute may be found in an ordinary jam-pot or similar jar and a small saucepan, the water in the latter, the glue in the former. Never attempt to heat glue in a single pot, or the contents will assuredly be spoiled.

With reference to gluing, while the glue is being rubbed on the wood, especially if a large surface has to be covered, of course it has a tendency to harden by cooling. To counteract this and to make the glue adhere it is generally advisable to warm the work to which it is applied, but in doing this bear in mind what has been said about heat bending boards. Occasionally both the surfaces to be joined should be glued before they are put together, which they should be while the glue is still hot on them. Do not wait till it congeals. If one may so express it, the glue is first stuck to each surface, and then the glue coalesces when they are brought in contact. When practicable—and it generally is so except in the case of large veneers—the glued pieces should be worked against each other with gradually increasing pressure, not only to expel any air between them, but to squeeze out as much of the glue as can be got rid of. On the extent to which this is managed much of the stability of the joint will depend. The thinner the film of glue between the pieces the more firmly will they adhere; nothing is gained by leaving a thick layer of glue. Indeed, the reverse is the case, and it is hardly too much to say that the effort should be to press out all the glue. Of course, to do this is not possible, but what remains will be so small in quantity—if the contiguous surfaces are true and bear uniformly on each other—that were it not for the thin hair line which marks the joint, and the different figurings on the pieces, it would be next to impossible to detect the presence of glue. To prevent the joint from opening, and to keep the surfaces in contact till the glue has set and can dispense with any auxiliary support, it is necessary to keep pressure on the parts. With large thin pieces such as veneers, joined superficially, not by the edges, the pressure is applied by means of a hot caul, which partially liquefies the glue in the joint and forces most of it out at the edges.

From all this it will be gathered that no benefit is gained by too lavish a use of the glue when rubbing it on the surfaces to be joined—unless it be by the glue vendors profiting by the waste. The consistency of the glue when made has not been mentioned yet, though it is an important matter. I mean, of course, its consistency when hot. The expert will adapt the thickness or consistency to the work he has in hand; but for the novice to do so would imply so much knowledge that he might fairly claim to rank as a skilled worker. It must therefore suffice to state that the glue should run from the brush like thick oil, not paraffin oil, but colza or olive oil, or to use other comparisons, which may perhaps be better understood, like melted butter or thin golden syrup. This may not seem very definite, but after all it is only an idea which can be given. A drop of suitably prepared glue if placed on a cold surface should quickly become a jelly. If too thin it will be some time in hardening sufficiently to be handled, and if it is so thick as to harden almost directly and be unworkable with the brush, it is obvious that more water is required. Another important factor in forming a strong joint is to use only freshly-made glue. The tenacity of glue is diminished every time it is heated up. In practice it is not necessary to make glue every time it is used, but certainly no one who knows anything about the way in which the strength deteriorates would think of constantly reheating the same lot. In the practical workshop this tendency to diminish in strength is of little moment, comparatively, as the glue-pot is in constant requisition; but with the amateur who, perhaps, uses it only at long intervals and in small quantities it should not be overlooked. Therefore no larger quantity should be mixed at a time than is likely to require heating up more than a few times. It is owing to neglect or ignorance of this quality in glue, as well as the mistaken notion that the more the better in a joint, that domestic gluing up is so often a failure.

(*To be continued.*)

SIGN WRITING AND LETTERING.

BY HENRY L. BENWELL.

III.—FREEHAND DRAWING—OUTLINING ORNAMENTS AND DEVICES—BLACKBOARD PRACTICE.

I TRUST the student has been closely following the directions laid down in the last chapter, for as "lettering" is nothing less than a special class of drawing, more or less advanced, according to the proficiency attained by the pupil in the higher orders of ornamental lettering, a good deal of practice, after the plan laid down in these preliminary lessons, is an absolute necessity.

Before I leave the subject of freehand drawing, I would like to give one little

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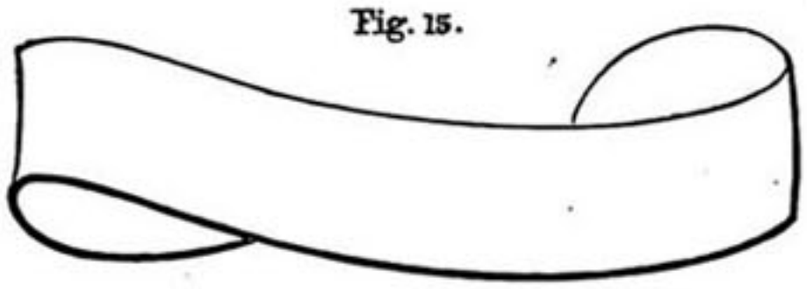
hint for obtaining facility in describing the circle, one of the best examples of free-hand drawing the pupil in lettering could have placed before him for practice. Of course, a perfectly true circle is quickest done with the aid of compasses, and these are always used in actual work, but it is, nevertheless, possible to produce one just as accurate with the hand, guided by the eye alone. This entails a close application to practice, repeated

Fig. 15.



and repeated again: but in course of time success is an ensured certainty, and the man or boy who can, off-hand, draw a circle in this way, is competent to undertake any branch of work that may be placed before him. In fact, I do not know of any better method of educating the hand and the eye, and of enabling the former to obey the dictates of the latter, than repeated practice in drawing the circle in all sizes, and without any extraneous aid.

In order to make my method of study in the first few chapters more clear to the reader, and so enable him to pursue his studies as I would suggest, I had perhaps better explain how I am endeavouring to train him for accomplishing the work I hope to expound later on.

Now, the true essence of proficiency in the sign writer's art lies, firstly, in training the eye to that degree of perfection that it can instantly detect the perfect from imperfect, the truthful from the untruthful in form, and is capable of at once judging the result of any work it rests upon. The workman must,

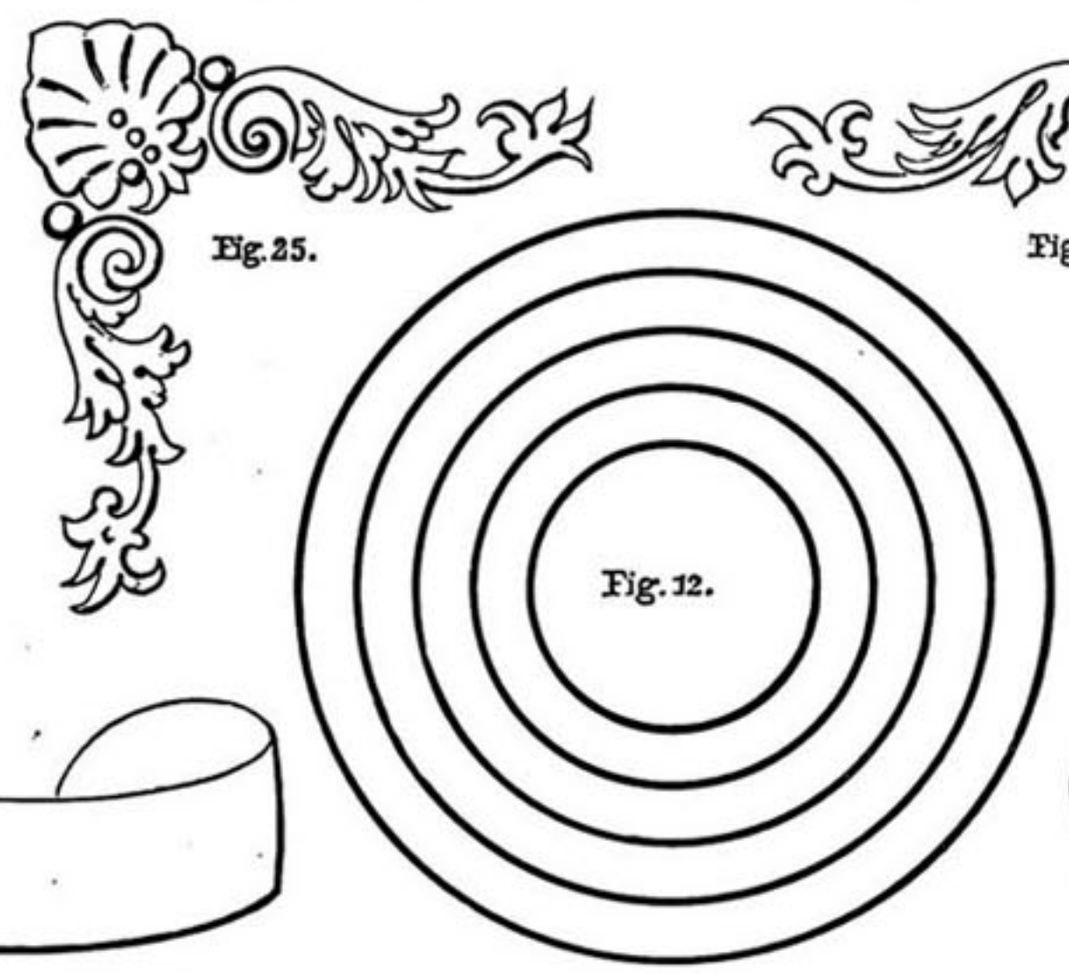


Fig. 12.

Fig. 25.

Fig. 26.

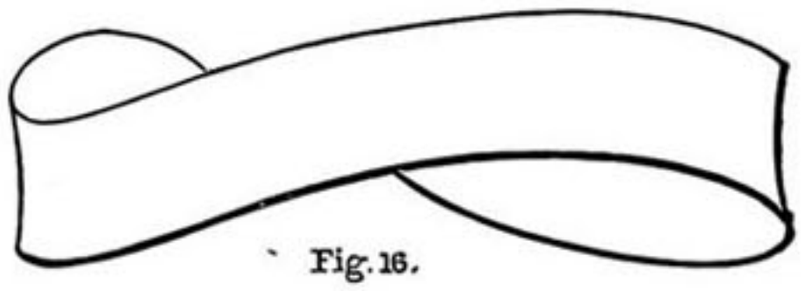


Fig. 16.

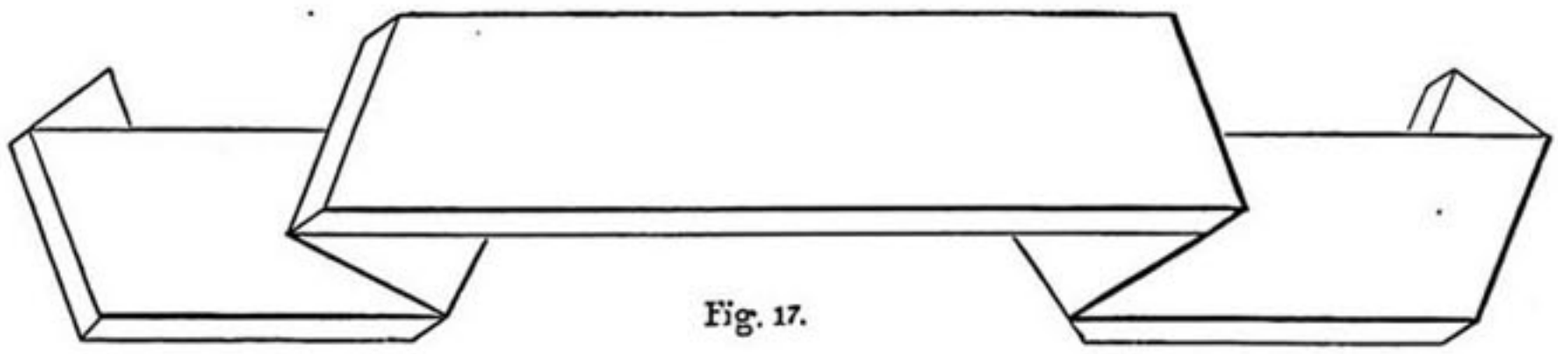


Fig. 17.

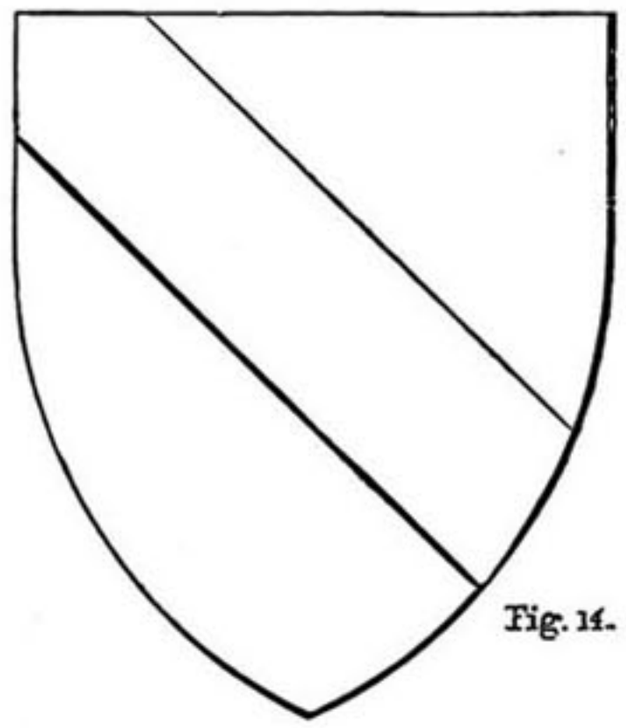
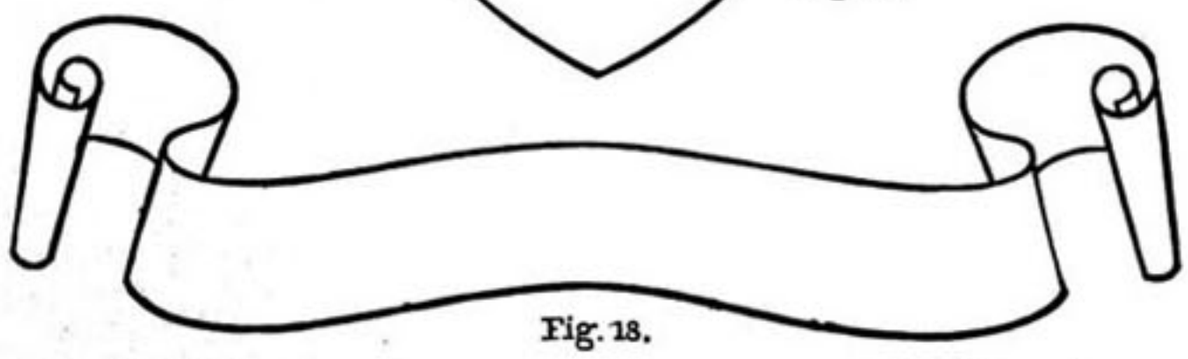


Fig. 14.



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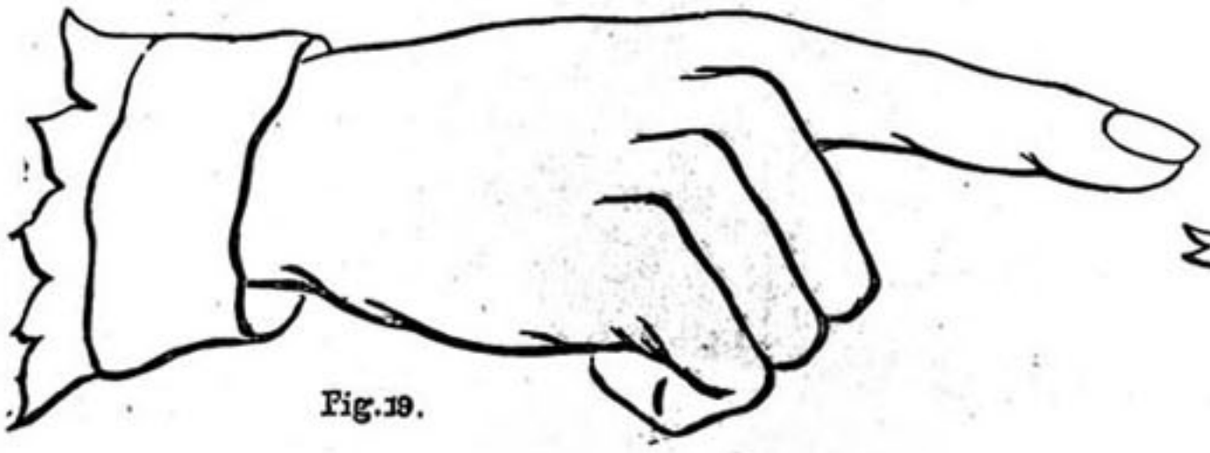

Fig. 19.

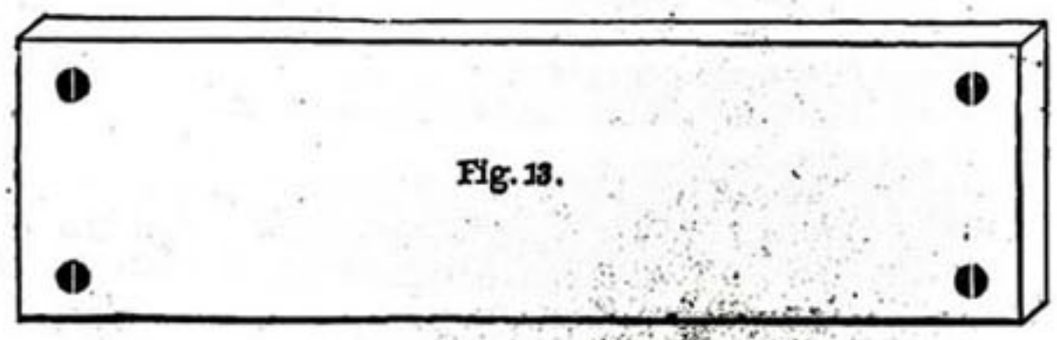

Fig. 13.

Fig. 24.

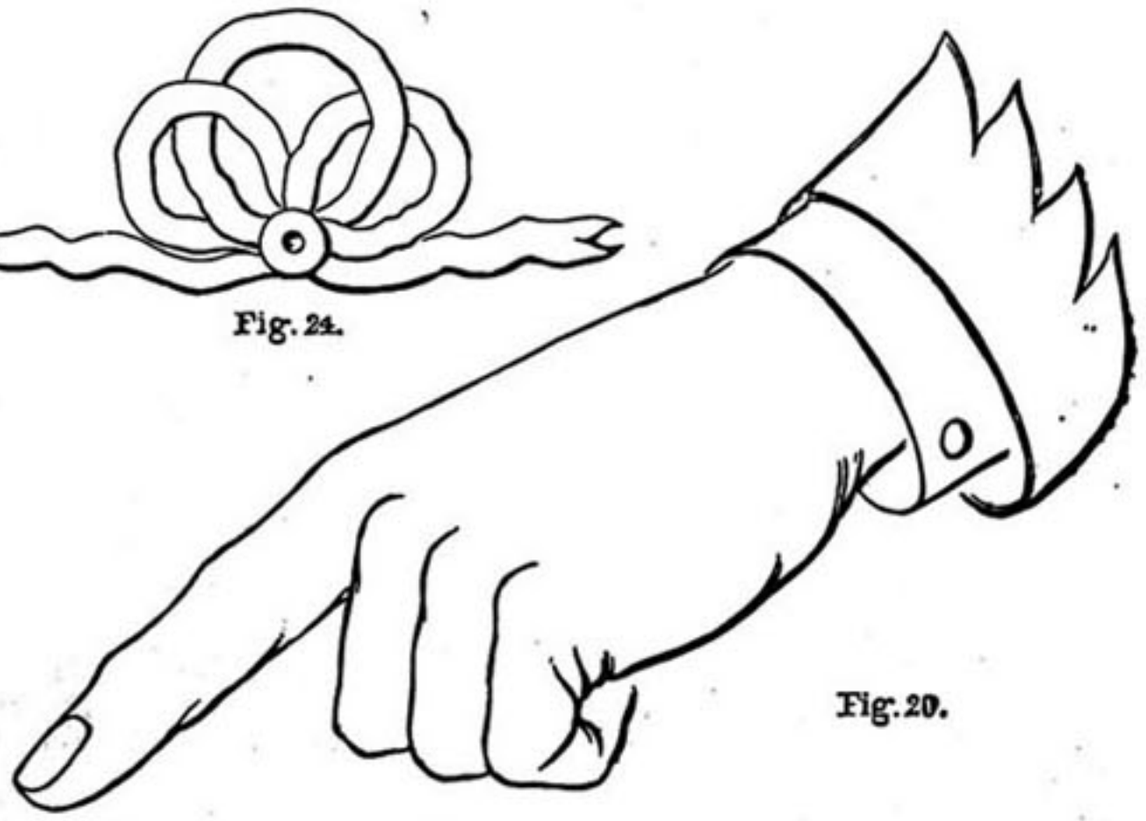

Fig. 20.

in fact, always be able to carry, "in his mind's eye," as it were, the accurate formation of all lines, curves, and objects incidentally portrayed in the usual routine of his work. And secondly, having advanced so far, he must next attain a perfect freedom and command over the hand, so that it is capable of giving a truthful rendering of the eye's invisible, but—let us hope—artistic will. Thus, to explain still further, we have before us a blank signboard, on which is to be written the name "JONES," and the usual lines being "mapped" upon it, we face it, and in our "mind's eye" we see the letters on the board, and at once proceed to put in a chalk or pencil mark around them—transforming the invisible into the visible, seen by all.

This is my own individual method of procedure, but I, of course, do not say it is followed by others, or, in fact, by anybody; but I do insist that, before a man proceeds to "chalk in" his work, he must, to a certain degree, picture to himself the size, shape, and construction of the letters, and the hand obeys the eye accordingly. And, regarding myself, I go even further, for I actually see the letters there before I draw them, so that the work resolves itself into a species of tracing. But this is theory, and open to contention, so I will say no more on the subject.

I have, I think, now explained the object of these opening chapters, viz., the proper and methodical training of

Fig. 12.—Concentric Circles. Fig. 13.—Plain Board with Screw Heads at Corners. Fig. 14.—Shield. Figs. 15, 16, 17, 18.—Scrolls. Figs. 19, 20.—Index Hands. Fig. 24.—Centre Ribbon Ornament. Figs. 25, 26.—Scroll Work Corner Pieces.

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the hand and eye, and we trust the student will follow us with due appreciation, as it is a matter most other writers on the subject have entirely overlooked.

The illustrated examples of freehand drawing and outline subjects which I give have been selected, to the best of my ability, for the special purpose we have in view, but as I have so urgently advised the novice to diligently practise the circle, I had better make some remarks on the best method of proceeding to work in this direction.

It is, of course, much easier to draw a small circle than a large one. The beginner should therefore make a start by describing a circle three inches in diameter, persevering until he is able to draw it, time after time, tolerably correct. This is best done on a large slate with slate pencil, but the slate should not be allowed to lay down upon the table. On the other hand, it should be held in a nearly upright position, propped up with books, held by the left hand, or, better still, placed on a small home-made easel, which is easily constructed.

Having made satisfactory progress with the small circles, proceed as follows:—

Describe a circle three inches in diameter, and then continue to construct larger ones outside this, and all at a given distance from each other, until the whole surface of the slate is covered. (See Fig. 12.) Practice in larger circles may afterwards be transferred to the blackboard with both chalk and brush, but the student must by no means bore himself with this or any one class of work, but should change about from one subject to another, so as to infuse variety and interest into his work.

We will next turn our attention to a few subjects which the sign writer is frequently called upon to paint, and this being so it is, of course, necessary he should know how to draw them with accuracy. I give some examples with this chapter, a series of outline drawings only, as copies for repeated practice.

In commencing practice use drawing paper tightly pinned upon the drawing board, and one of Rowney's twopenny HB. pencils, which is the best for beginners, as it gives a good bold stroke, and the lead is thick and very easy to work with. In drawing these examples compasses and rule are now permissible. Nevertheless, I would still recommend that they be drawn in freehand for a time—in fact, in order to set

Fig. 23.—Crown.

Fig. 21.—The Royal Arms.

Fig. 22.—Prince of Wales's Plume.

a good example, I have myself done some of these drawings with the unaided hand, and with the pen I am writing with, merely using Rowney's liquid Indian ink instead of ordinary writing ink; and, be it known, it is much more difficult to execute freehand drawing with a pen than it is with a pencil. It is good practice, however, to follow the pencil lines over with Indian ink, and as a suitable pen I use Gillott's school pen No. 351 F., and Cassell's series of drawing books.

Having tired of pencil and paper, the student must next bring his blackboard into requisition, a description of which has already been given. He will also require a box of Rowney's white demonstration chalks—this is a tapered chalk four inches long, and is more expensive than the ordinary blackboard chalk, which, however, would be of no use for our purpose — a camel-hair writer, a thin piece of "planed" board to act as a palette, and some white (zinc) paint thinned out to the proper consistency with a little *sweet* oil, and some old dusters or bits of rags.

We now commence at the beginning again, and proceed to draw the straight lines, curves, circles, etc., with the chalk, but on a larger scale. This last remark reminds me that I have omitted to say—as I should have done in the first chapter—that it is not necessary for the student to continue to draw his copies exactly the same size as they are given in these pages, although for the purpose of the eye training, as just laid down, he should for some time endeavour to draw them to the same scale, and ascertain by measurement how far he is out when his drawing is completed. After that it is also necessary to become proficient in both reducing and enlarging, and we would therefore advise that the student should, after awhile, make each succeeding drawing larger than the preceding one, and taking this last as his copy for the next one. He can thus go on until he reaches the limits of a full-sized sheet of drawing paper, so that when he comes to practise upon the blackboard he will gradually have worked up to the enlargements almost without being aware of it. He should keep all these intermediate drawings as copies to practise from on his blackboard, and it will be a good plan to work backwards until at last he actually makes an enlarged drawing on the blackboard from the drawings in these pages; but in doing this he

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should put his other drawings out of sight.

I will now suppose that the pupil has been practising for some hours on the blackboard with chalk, and has redrawn each subject several times over. He should now take his camel-hair writer, and having worked a little white paint on to his extemporised palette, and having thoroughly cleaned the chalk marks from his board, he should proceed to draw all the freehand subjects with his brush and paint, commencing with straight lines and curves. His first object is, of course, to be able to make a line, with his camel-hair writer, of the same thickness throughout. He may now use a mahl stick to rest his wrist upon, or may rest his right hand on the left wrist, the left hand being placed against the board. If his hand is steady and firm enough, however, he had better dispense with either in all his preliminary work, as he will then be the better able to appreciate the help of a mahl stick when it comes to the "grim reality." Here again I may say I have never had one, although, possibly, better work would have been the result if I had. It, however, shows they are not absolute necessities for a young man with a steady hand and of sober habits.

The workman should make his lines, as far as possible, with the point of the brush and not with the side. He must work with a bold, unhesitating hand, if he wishes to give a firm and finished appearance to his work. Any timidity or hesitancy on his part will only end in a very dubious result, and at once betray the hand of the novice. The white paint should be of just such a consistency as to flow freely and evenly from the pencil, and at the same time giving sufficient covering power on the board. The brush is held in much the same way as a pen in ordinary writing; it should not, however, be grasped too tight, as the strain on the sinews of the hand tends to cramp it, which very soon tires it and so renders it unsteady.

As soon as the board is covered all over with paint marks, it must immediately be wiped clean with a piece of rag, which has previously been steeped in a little common turpentine. It is as well to have the paint in a tin dipper, which will be described hereafter.

Coming next to the series of outline subjects given with this chapter, I would impress upon the student the desirability of practising these on the blackboard until he is absolutely perfect, and able to turn out a passable specimen of each one. Fig. 13 is a plain board with a screw head at each corner; Fig 14 a plain shield; and Figs. 15, 16, 17, 18, a series of four scrolls. Next we have a pair of hands (Figs. 19 and 20), one pointing in a horizontal direction and the other downwards. The Royal Arms (Fig. 21) will, no doubt, prove the most difficult subject to tackle, but as the sign writer is so frequently called upon to paint it, he must take it very seriously in hand, and, after he has gained some little experience in the manipulation of his brush, he will find it not so difficult as it at first appears, and he will soon be able to draw it in proper proportions with the greatest facility. He should firstly draw the subject on the board with chalk in a somewhat sketchy manner, allowing his hand a roving freedom, and relying more on his pencil brush for afterwards putting in the lines in a firm, masterly way. This subject is only treated here purely as an outline example; the method of shading will be described, and the colours to be used given, in a later chapter. The Prince of Wales' Feathers (Fig. 22), being a much easier subject, had better perhaps be attempted first. The Crown (Fig. 23) is more difficult, and a little practice will be necessary to draw it to the correct shape. Fig. 24 is a centre ribbon ornament, and Figs. 25 and 26 two scroll work corner pieces. The student should not confine himself entirely to the examples given here, but should draw anything that comes in his way, if it is likely to be of use to him. He will find plenty of other subjects in books and illustrated advertisements, and even on the poster hoardings in the street. He should also go round, sketch-book in hand, and jot down any little bits of good work which he may take a fancy to over the shop fronts and other places of business. He may afterwards make finished drawings of them at home for future use and practice. Making use of his brains in this way will prove of great assistance to the student in his course of self-tuition.

(To be continued.)

CRYSTOLEUM PAINTING.

BY O. BECKERLEGGE.

II. — How to Render Photo Transparent—Painting — Suitable Colouring for Portrait — Treatment of Details — Second Painting—Draperies and Background—Finishing and Mounting — Landscapes — Colouring Foliage, Clouds, etc. — Conclusion.

Our next business will be to make the picture transparent. To secure this end several modes are adopted. There is a crystoleum wax sold. This has to be melted in a bath, and the picture soaked in it until the transparency is obtained. I have no doubt this is a good plan, but I have not adopted it, as it necessitates bath, lamp, etc., and there is the danger of overheating the wax, when it is said to turn yellow. I have a shrewd guess that the so-called prepared wax is nothing more or less than paraffin wax. The plan I adopt is one which dispenses with the bath, etc., and saves the expense of wax. Take a little of the poppy oil and pour it on the picture. When it has stood an hour or two the picture will be beautifully clear. Drain off all the oil and it will be ready for painting. I have also tried copal varnish, using it as the oil, but I have the most confidence in the former. Some recommend sweet oil, by which I presume olive is intended, but of that I have no practical knowledge. It seems to me that almost any clear oil or varnish that will dry would answer the purpose.

Well, having got our work up to this point let us proceed to the painting. I will suppose it is your own portrait. According to your complexion, hair, etc., so must be your colours.

Presuming I am giving instructions to one quite unused to paint, let me mix the paint for you.

Eyes. — *Blue*, cobalt; *black*, vandyke brown; *grey*, cobalt and black; *brown*, burnt sienna.

Hair.—*Very light*, Naples and Indian yellow; *medium light*, burnt sienna; *dark*, burnt sienna and vandyke brown.

Cheek and Lips. — Carmine and vermilion.

Complexion. — *Light*, white, carmine, and Naples yellow; *dark*, white, Indian yellow, vandyke brown.

Silver. — White and black. Gold.—Naples and Indian yellow, burnt sienna. Of course, it will be understood that a variety of tints can be produced by the paints named. We must, therefore, use our judgment as to the quantities—as, for example, two persons may be dark, but the colour may be very different; in one case the yellow may prevail, in another the brown—so for hair. We must, of course, bring our judgment and taste to bear on these matters. I will make a few remarks on landscape painting further on.

Let us now proceed to details. With a very fine pointed brush put a point of light in the eye—any picture, even an engraving, will suggest where it should be placed. This representing the reflected light in the eye, gives brilliancy and character. Then the iris, blue or brown, as it may be necessary; the white of the eye, white and a tinge of Naples yellow. Next work on the lips and cheeks; the latter, carmine only, using judgment as to depth of tone. As Opie said once, "mix your colours with your brains." Then put in the hair, using only transparent colours, as I have indicated. Linen, lace, etc., white with just a trace of blue to take off the rawness; jewellery, as before indicated, whether it be silver or gold. Flowers and foliage, as per nature. All this to be painted on the transparent photo. There must be no attempt at shading, either now or at the subsequent stage. The photo, if it is a good one, will provide all that, and if it is not a good one you cannot improve it. All your various studies can be brought up to this point, supposing you have several on hand. They must now stand over till they are hard, which will be by the next day.

We must now proceed to the second painting. When the first paint is dry, remove any dust that may have settled on the glass. Take the second glass and rub it so that there may be no dust, fluff, or grease on it. Provide a strip of gummed paper—the margin off stamps will do admirably—let them be, say ⅜ of an inch wide, place the second glass on the first, and fasten them together on the edge by the gummed paper. Now take your colour for the face and hands, mixing it with a little poppy oil; it will be understood that the paint in every instance is brought into a fit consistency for work by mixing it with this medium. Pass the colour over face and hands, simply taking care to keep to the outline. By turning it over during the operation you can easily see whether you have come too far, or not far enough. Any alteration can easily be made—the entire paint removed, if needs be—without doing any injury to the picture.

Draperies must be painted in the same way, our judgment guiding us in the tint. The background will now claim our attention. The tint will, of course, depend to a great extent on the main subject. A nice effect will be produced if the several colours, blue, yellow, and red, be placed in patches on the glass, and then mixed all up together. A soft prismatic effect will be the result, one tint gradually fading away into another.

When the work is done as near to your satisfaction as possible, cut out a piece of cardboard the size of the glass, and with strips of gummed paper bind the edges all around to keep out dust, etc. It may then be mounted in a plush frame, or, if preferred, a narrow gilt frame will look exceedingly nice if a narrow fold of plush is glued in the rebate of the frame so as to project, say, ⅛ of an in. in the place of the usual flat. This narrow beading of plush will cover the

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strips of paper which bind the picture together. If in the progress of our work we find the details painted on the first glass are either too hard or not distinct enough, it can easily be remedied by cutting down the gummed paper on one side and opening the glasses, and retouching or softening the first colours as may be desired. Do not cut down the two edges, as you may find some little difficulty in bringing the two glasses in exact correspondence. By leaving one side secure the glasses will find their true position.

Should we purpose painting a landscape, then let the foreground with its details be painted on the first glass; middle distance, clouds, sky, etc., on the second glass. I can only indicate, of course, in a general way what colours to use, as every subject must be treated according to its nature.

A dry open road, Naples yellow, white, and tinge of red. Foliage, with a glint of sunshine on it, soft greens, yellow predominating; sombre greens, blue, burnt sienna; sky, cobalt, and white with a tinge of either red or yellow towards the horizon. Instead of putting on these in distinct washes, as would be done in a water-colour drawing, a dab of the colour should be put on the horizon, and then mixed together on the glass; this will give soft mysterious blendings of colour, the soft light melting into the blue above it. Very distant hills, blue and red; prominent spurs should be lit up with the colour of the horizon, but just a shade lower in tone. Water must take its tone from the sky. Clouds, various shades of grey made with white, blue, and red in different proportion, with a little Naples yellow. In all these cases the shadows in clouds, mountains, etc., must be put on first, the lighter tints behind them.

Any one following these instructions will be able to produce work which will give satisfaction. From briefer notes than these I acquired the art, and I know that persons have been able to turn their knowledge of the art to commercial advantage who have acquired that knowledge simply by reading instructions even briefer than those I have given. Should any little difficulty arise, I shall be happy to answer a question. On reading what I have written, I find I have omitted to mention that the eye-brow and nostrils must be painted on the first glass. For the eye-brow use colour as per hair; soften it towards the eye with a dry brush, stroking downwards.

NOTES FOR ELECTRO-PLATERS.

BY GEORGE EDWINSON BONNEY.

I.—INTRODUCTION—ACID—ACETIC ACID—ACETATE OF COPPER—ACETATE OF LEAD—ACETATE OF SILVER—ACETATE OF ZINC—ACETATE OF IRON—ACETATE OF MERCURY—ACETATE OF ALUMINA—ACETATE OF COBALT—ACETATE OF NICKEL.

THE following notes have been collected from various sources of information, and have proved of some use to me in my work. I now offer to share the benefits I have received from them with my fellow-workers. They are here arranged nearly in alphabetical order for easy reference, and may thus be regarded as an Electro-plater's Dictionary.

Acid.—The acids in general use among electro-platers are: acetic acid, hydrochloric acid, nitric acid, nitrous acid, sulphuric acid, and sulphurous acid, all described under their respective headings. "Most of the acids are soluble in water; they possess an acid taste, and have the property of turning blue litmus solution red. All acids contain hydrogen, combined either with an element, or with a group of elements, which almost always contains oxygen, and in this case the substances are termed *oxi*-acids." (Roscoe.)

Acetic Acid.—French: *Acide Acétique.* Chemical formula, $C_2 H_4 O_2$. Common vinegar is dilute acetic acid prepared by the acetous fermentation of alcoholic liquids. Crude acetic acid (named also pyroligneous acid) is prepared on a large scale by the dry distillation of wood, Glacial acetic acid is obtained by heating acetate of soda with strong sulphuric acid. This acid is a colourless liquid, with a peculiar, sharp, pungent odour, and strong acid flavour. It will mix with alcohol, ether, or water in any proportion. When concentrated by distillation, it boils at 118° C., and solidifies at 17° C. to an icelike mass, hence its name. It will blister the skin, and dissolve camphor and several resins. It forms with bases some important acetates, described under their respective names.

Acetate of Copper.—French: *Acétate de Cuivre.* There are two substances commonly named acetate of copper. One of these—ordinary verdigris—is only a subacetate of copper obtained by spreading the marc of grapes (vintage refuse) on copper plates exposed to the air during several weeks. This forms a bluish-green salt, not entirely soluble in water. The true acetate of copper (sometimes known by the names: crystals of Venus, crystallised verdigris, and distilled verdigris) is made by dissolving common verdigris in hot acetic acid, and setting aside the filtered solution to cool. The salt forms beautiful dark-green crystals, which are soluble in water in the proportion of one part of the salt to fourteen parts of water. Mr. Smee says: "A solution of acetate of copper is difficult to decompose, requiring the intensity of several cells." Acetate of copper is used in making up brassing solutions. It is very poisonous.

Acetate of Lead.—French: *Acétate de Plomb.* Described as plombic acetate, Saturn's sugar, and sugar of lead. This salt of lead is made in large quantities for commercial purposes by dissolving litharge in strong acetic acid. It is generally met with in the shape of heavy white crystals, or a mass of them, resembling loaf sugar; this, coupled with its sweetish flavour, has ensured for it the name of sugar of lead. Sugar of lead is poisonous. It is soluble in one and a half parts of water, and in alcohol. "In a solution of acetate of lead, zinc is the only metal that receives a coating of lead by simple immersion." (G. Gore.) This property has led to the performance of a beautiful and simple experiment illustrating the arborescent formation of metallic crystals. A small piece of zinc is suspended by a fine brass wire from the bung of a pickle bottle nearly filled with a solution of lead acetate in distilled water. As the zinc dissolves, crystals of lead take the place of the dissolved zinc, and arrange themselves around the wires in the form of vegetation, and is then named a lead tree. This salt is also used in making up solutions for the electro-deposition of lead. (See *Lead, Electro-deposition of.*)

Acetate of Silver.—French: *Acétate d' Argent.* Mr. Gore has tried a solution of this salt, and says: "For depositing purposes, a solution composed of water twenty parts, cyanide of potassium four parts, and acetate of silver one part, conducts very freely, and yields a fine white deposit of silver." The salt may be made either by adding a solution of acetate of potash or of soda to a solution of nitrate of silver as long as a precipitate occurs, decanting the liquid, and washing the salt in the usual way, or by digesting the oxide or the carbonate of silver in hot and strong acetic acid.

Acetate of Zinc.—French: *Acétate de Zinc.* This salt may be made, either by dissolving zinc in strong acetic acid to saturation, or by adding a solution of lead acetate to a solution of zinc sulphate, as long as it produces a precipitate; filter, evaporate the liquid, and set aside to crystallise. This salt is sometimes mentioned in some formulæ for brassing solutions.

Acetate of Iron.—This has been recommended as an antidote to poisoning by cyanide solutions. There are two acetates of iron—an acetate of the protoxide of iron (crystals of small greenish-white needles), and acetate of sesquioxide of iron, "a dark-brownish-red, uncrystallisable liquid, of powerful astringent taste." (Fownes.) The ordinary "steel drops" sold by chemists will serve every purpose required here.

Acetate of Mercury.—A solution of this salt will deposit its metal on iron by simple immersion. Prepared similar to acetate of silver.

Acetate of Alumina.—A gummy mass used in calico printing.

Acetate of Cobalt.—A violet-coloured deliquescent salt.

Acetate of Nickel.—A green salt of this metal, soluble in water. Of no special interest to the electro-plater.

(*To be continued.*)

WHY DOES A TOOL CUT?

BY J. H.

II.—SENSITIVENESS OF TOOLS—IMPAIRING WEDGE FORM—GRINDING CHISELS—FACETS MADE IN SHARPENING—GRINDING, WHEN NECESSARY—DRILLS—LIP DRILL—TWIST DRILL—REAMERS—TAPS AND DIES—WHEN SUCH TOOLS CEASE TO OPERATE—SAWS AND FILES—WORK DONE BY TOOL—ITS TEACHING—PRESENTATION OF TOOL.

I WILL now briefly illustrate the principles laid down in my previous article by examples taken from common tools. Of these, the kinds used for wood working are more sensitive to ill-treatment than those used for working metal, and of the latter those which are operated by hand than those actuated by machine. The reason is, of course, that the more delicate the nature of the work, the more readily is the action of the tool felt. There are numbers of tools in daily use in the machines of our factories which are badly formed, so causing a great waste of power, that would not and could not be tolerated if they were hand worked, because the hand and arms soon rebel against the excess of energy required to operate badly formed tools. The stresses on the machine-worked tools on the other hand are only apparent in excess of friction, the evils of which are not so evident to some workmen as excess of muscular effort.

Take first those cases in which tools do not cut because the wedge form is impaired. The chisel, and all chisel-like tools, should be ground with one facet only, not with several. This applies alike to the chisel for wood working and for metal cutting, to the gouge, the axe, adze, knife, razor, plane-iron, spokeshave, and others of similar type. The reason why it must be so in order to develop the full efficiency of these tools is apparent from the illustrations.

Thus, comparing Figs. 6 and 7, which are slightly exaggerated for the purpose of illustration, Fig. 6 shows how a chisel-like tool ought to be ground, the concavity of the facet exactly corresponding with the curve

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of the stone upon which it is ground. To grind it like this requires some practice in the case of broad chisels and plane-irons, the tendency in unskilful hands being to produce a succession of facets like Fig. 7, due to the slipping up and down of the tool on the revolving stone. But the advantages of Fig. 6 are very great.

First, the necessity for regrinding is delayed much longer than in Fig. 7, where the facet is on the whole convex instead of concave. Fig. 6 approaches to the hollow razor form, Fig. 8, and for some little time the grinding angle and the sharpening angle will coincide; after awhile it becomes necessary to tip the facet in sharpening, Fig. 9, and the sharpening angle is gradually rendered more obtuse until regrinding becomes necessary. But in Fig. 7 the sharpening angle is obtuse from the commencement, and regrinding is soon required. Moreover, since the angle is so obtuse, a greater expenditure of energy is necessary to remove the shavings than in the former case, because the latter has less penetration than the former. This is apparent from the dotted lines, which show the effective angles of the two by comparison.

A good workman, therefore, always endeavours to preserve the wedge-like form to his tools as long as possible, regarding the grinding of the hollow facet as a matter of cardinal importance.

Chisels are often badly sharpened by tilting up the face for the purpose of turning back the wire edge. The result is that the face is like Fig. 10.

This again detracts from the wedge form. Worse than that, it vitiates a very important point in chisels worked by hand; it destroys the guidance afforded by a perfectly flat face. The chisel must be tilted before it will cut, and being so placed, there is no longer that contact of broad faces which is conducive to the guidance of the tool, and the difficulty of cutting surfaces and ends is much increased thereby.

No matter how flat the general area of the chisel face is, if there is a second facet, however narrow at the cutting edge, that determines the action of the tool. The tool angle is measured between that and the sharpened facet on the bevelled face. Hence the need of care in these little matters where amateurs are so apt to fall into error.

Of course, with all tools the labour of cutting becomes increased as the wedge form is unavoidably impaired by legitimate use, that is as their keen edges become dulled, in other words as their angles become more obtuse. When the amount of this is slight only, we resort to *sharpening*. When, by repeated sharpening, the tool angle becomes very obtuse we remove material in greater quantity by *grinding*.

There are many serviceable tools which we are accustomed to class with the cutting tools, which cannot be said, literally and strictly, to cut because they have not the wedge form. Among these are included the common drills, the screw taps and dies, the reamers, and other forms. Thus the common drill, Fig. 11, by reason of the overhang of its cutting face, A, makes an angle greater than 90° with the face of the work, and it is simply a scrape, though, by reason of the coercion exercised upon it, it really removes tolerable chips or shavings. But the lip drill, Fig. 12, is a cutting tool, being a true wedge.

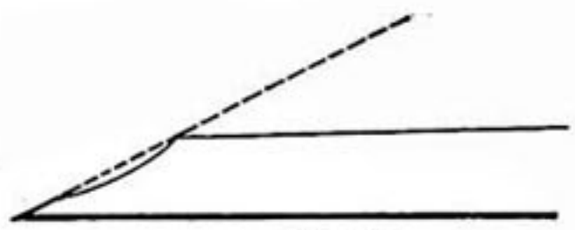

Fig. 6.

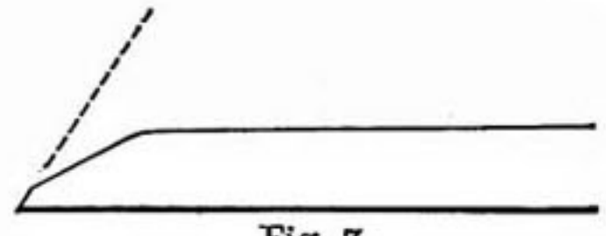

Fig. 7.

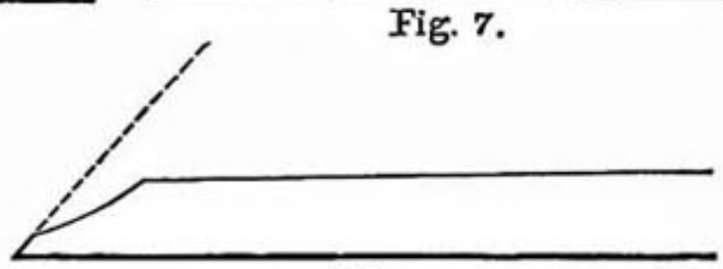

Fig. 9.

Fig. 8.

Fig. 10.

Fig. 13.

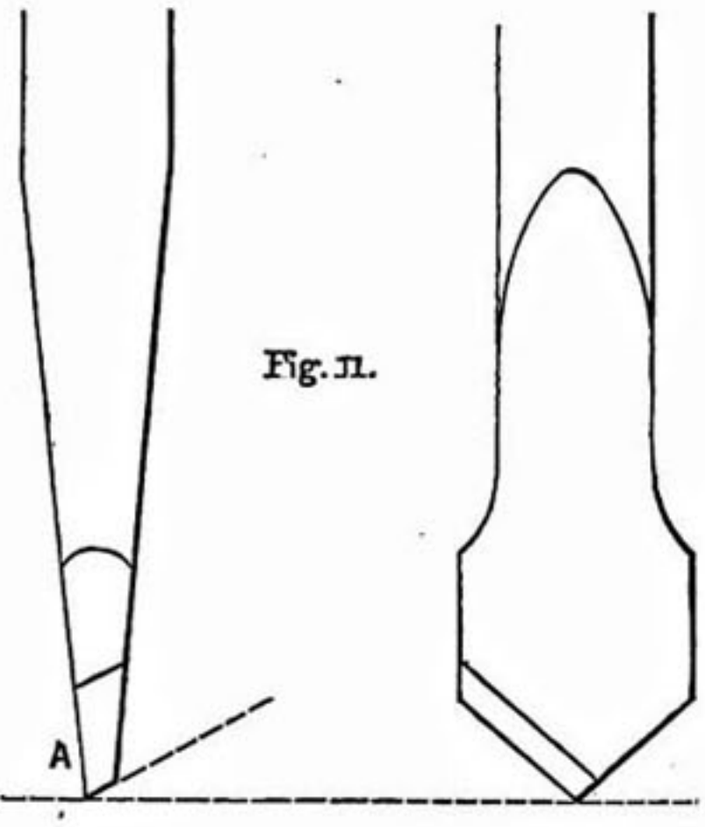

Fig. 11.

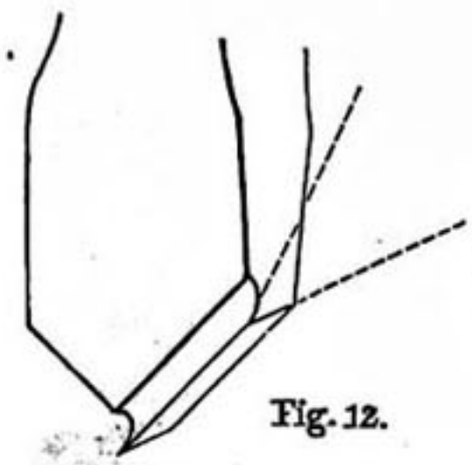

Fig. 12.

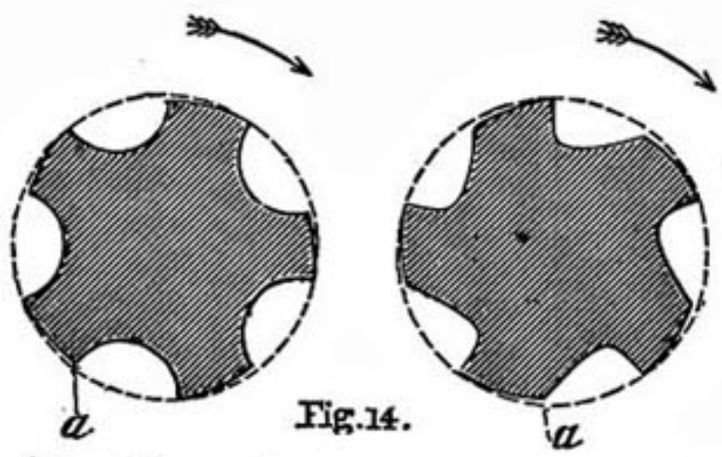

Fig. 14.

Fig. 6.—Chisel Ground Correctly. Fig. 7.—Ditto, Incorrectly. Fig. 8.—Section of Razor. Fig. 9.—Obtuse Sharpening of Chisel. Fig. 10.—Chisel Tilted by Bad Sharpening. Fig. 11.—Common Drill. Fig. 12.—Lip Drill. Fig. 13.—Twist Drill. Fig. 14.—Sections of Reamers and Taps.

But much superior as a cutting tool is the twist drill, Fig. 13, whose angle, A, is acute or wedge-like. The angle of the spirals remains constant throughout the life of the drill. Figs. 12 and 13, therefore, have the top rake, which is absent in Fig. 11. All alike have sufficient clearance, or relief angles. Very few reamers or taps have any top rake, and they are not therefore wedges. Even in the best designed forms the top or cutting face is perpendicular to the work, as in the reamer, two of whose sections are shown in Fig. 14, and the taps, whose sectional forms are similar to those which are shown in Fig. 14.

But then these remove material in fair quantity because of the strength and coercion exercised in operating them, and because they are all backed off, as at *a*, *a*, preventing excessive friction between the tool and the work. Each of these tools ceases to operate when the primary conditions become vitiated chiefly in their case by the wearing back of the keen edges obliterating the angles of clearance, to which the efficiency of Fig. 14 is largely due. Because their form is unfavourable for cutting, and because they so readily lose their pristine edges, very great care is necessary to avoid all contact with rough cast or forged surfaces, as the case may be.

Saws and files operate not as wedges but as a multitudinous assemblage of scrapes. The minute teeth have abundant clearance, a highly important matter; but as the front faces of the teeth lean back beyond the perpendicular they cannot penetrate as wedges. One thing which tends to sweetness of working by diminishing the friction is the diagonal sharpening of the tooth faces in the case of the saws, and the diagonal arrangement of the lines of teeth in the files. By these devices the material is attacked in detail, just as when using a broad wood-working chisel we move it diagonally across the face of the material to ease the labour of cutting, or just as the shears or scissors divide material in detail.

The vast difference in the amount of work done by a tool that cuts efficiently and one that only scrapes, should read an instructive lesson both on the importance of correct tool formation and the maintenance of the same, which is seriously impaired by every departure from the wedge-like form.

The wood-worker's chisel, axe, and adze, keen and acute, remove material in large quantity. The screw tap, the die, the reamer, the file, the saw, remove only fine scrapings or "swarf" even when working at their best. The turner's roughing tool cuts off great shavings to a considerable depth; the broad finishing tool and the scrape remove only thin parings. In the one the wedge-like action is perfect, and seen at its best, in the other that action is nearly or quite absent.

Much might be said about the influence of the method of presentation of the tool to the work as affecting results. But this would really be resolvable into conformity with or departure from correct tool angles, so I need say nothing on this point just at present.

The whole subject of tool formation is one of a highly interesting and practical character, and one which every workman should study. I have simply endeavoured to touch the fringe of the subject by showing why some tools cut while others do not. In subsequent issues I shall have more to say about some of the common tools, their principles of action, and the manner in which they are used.

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OUR GUIDE TO GOOD THINGS.

17.—Britannia Company's New Lathe Dogs for Face Plates.

In No. 2 (page 17) of this magazine instructions were given for making a home-made dog chuck or face plate, and the method to be followed in making lathe dogs for it was described as well. There may be some workmen, especially amateurs, who, though they may contrive to make the chuck, may not have either the skill or the time to make the dogs, and it is in the interest of such as these and many others who may be desirous of purchasing lathe dogs ready to hand, that I give in Fig. 1 illustrations of some excellent things of this kind that have been recently manufactured by the Britannia Company, Colchester, and may now be had from the Company direct or through any dealer in tools. The three varieties figured clearly show the purpose for which they are intended and the way in which each is to be used, so any detailed description is unnecessary. The price of the dog in the centre is 1s. 6d.; of the one on the right, 3s. 9d.; and of the one on the left, 5s. They are well made of black iron, and the screws externally and internally are carefully cut.

18.—Melhuish's Chamfer Plane.

To save repetition of names and at the same time to let every reader know where the articles mentioned may be obtained, if he cannot get them nearer home, I may say at once that the chamfer plane now under consideration and every other article yet to be described in this notice is supplied by Messrs. Richard Melhuish and Sons, 85 and 87, Fetter Lane, E.C., who have submitted specimens to me for examination. The make and action of the plane may be gathered from Fig. 2, in which the cut to the left gives a view of the plane when looked at from above, and that to the right of the bottom of the plane. The merit of this plane is that the cutting edge of the iron goes nearly up to the strip of brass that is screwed on to the front of the plane, so that even in the case of a stop chamfer the chamfer may be carried nearly close home to the stop. By means of the fence that is attached to the bottom it may be regulated by loosening the screws and permitting the fence to travel either way as may be required as far as the slots will permit. Chamfers ranging from ⅛ in. up to 1 in. within may be readily cut. This plane is made in beech in two sizes, 4¾ in. and 6 in. in length, sold at 4s. 6d. and 6s. 6d. The fence of the larger plane is of boxwood. It works well and easily when in use, and should be found in the stock of every wood worker, being preferable in every way to the spokeshave-like tools of this class, which, although they are good and serviceable in themselves, are not nearly as handy as the tool just described.

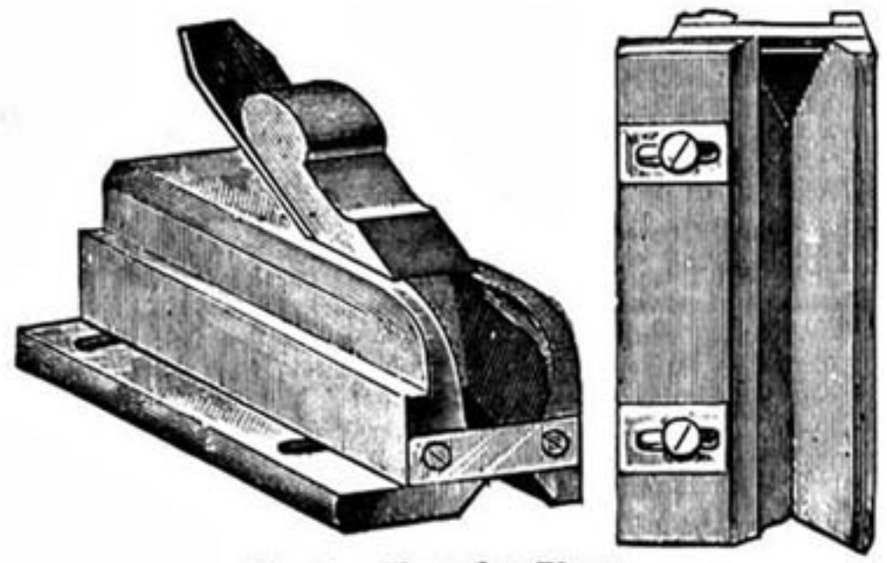

Fig. 2.—Chamfer Plane.

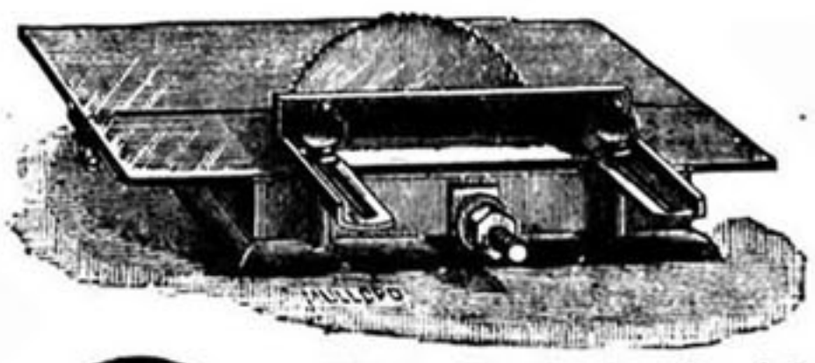

Fig. 6.—Circular-Saw Bench for Work-Bench.

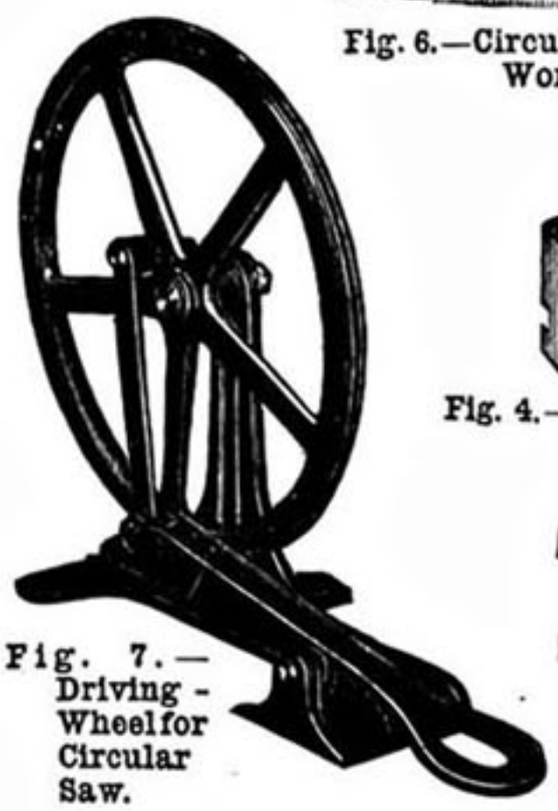

Fig. 7.—Driving-Wheel for Circular Saw.

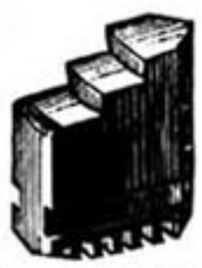

Fig. 4.—Jaw of Chuck.

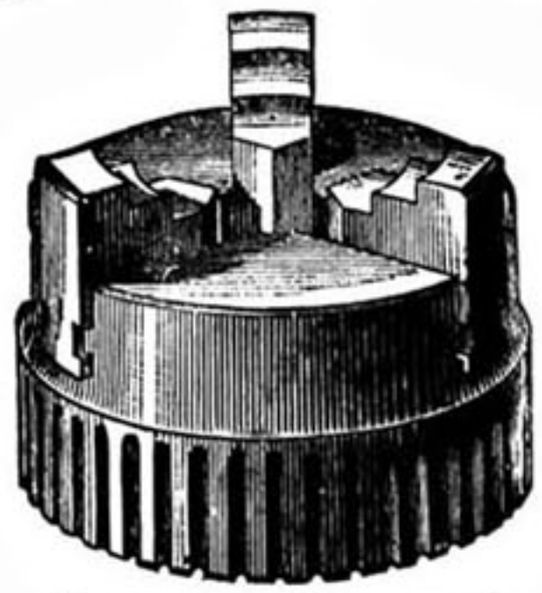

Fig. 3.—Small Three-jawed Chuck.

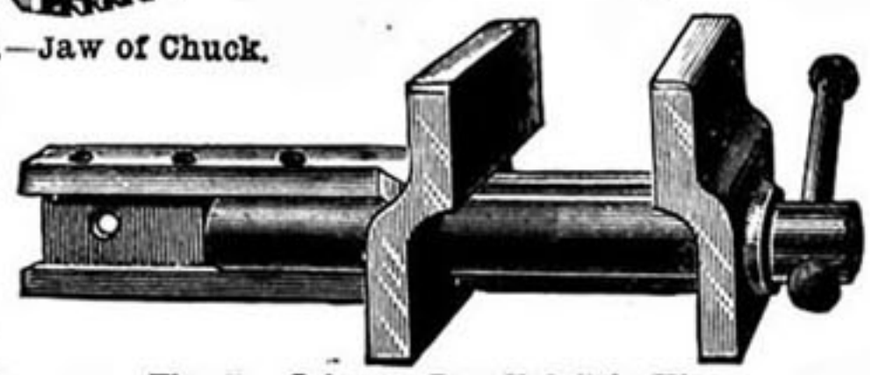

Fig. 5.—Joiner's Parallel Grip Vice.

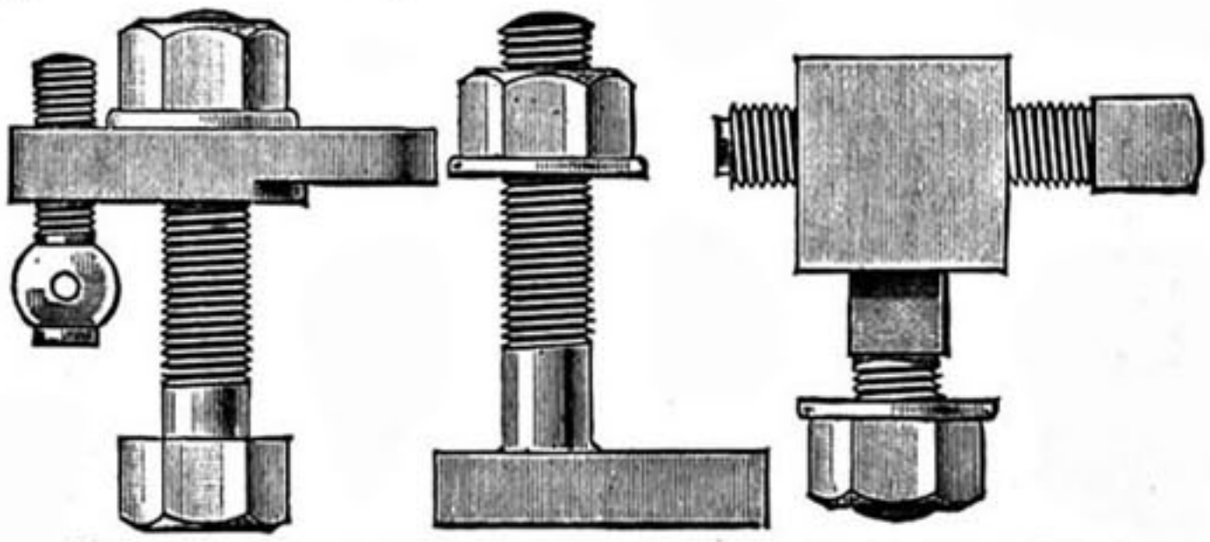

Fig. 1.—Britannia Company's New Lathe Dogs for Face Plates.

19.—Small Three-jawed Chuck.

This little Three-jawed Chuck which is illustrated in Fig. 3 is of French origin, and being much better finished than chucks of this kind usually are, will doubtless be welcomed by those who require a small appliance of this kind for light work, although its price is 32s. The general character and formation of the chuck is exhibited in Fig. 3; and in Fig. 4 is shown one of the jaws of the chuck, these being removable at pleasure. Each chuck has two sets of jaws. The jaw in Fig. 4 is formed reversely to those shown in the chuck in Fig. 3, being intended for drill work.

20.—Joiner's Parallel Grip Vice.

Vices of this pattern are apparently not so widely known and used as they ought to be, and many a carpenter and joiner still keeps to the old wooden bench vice with its wooden screw, although by the adoption of the Parallel Grip Vice much time is saved, because by the latter wood can be seized and secured instantly by the third of a turn of the hand, while with the former the jaws must be opened, perhaps with many a turn, to a sufficient extent to receive whatever it is wished to place between them, and then tightened with more turning—a marvellous contrast to the rapid and effectual action of the grip vice, whose rack can be thrown out of gear at once by an upward motion of the hand, and the front jaw pulled out, pressed against the wood, and then tightened in an irresistible and unmovable grip by a similar movement of the hand downward. The pattern shown in Fig. 5 is fixed to the bench from beneath as indicated, and the top of the jaws are level with the surface of the bench. Like all the grip vices, its holding force is so great that if a long piece of wood be clutched by one end in the vice its weight will be powerless to alter its position in the vice in the smallest degree. Its cost is 13s. 6d.

21.—Parallel-jawed Pliers.

When pliers of the old style are opened it will be noticed that, as a matter of course, there must be a greater divergence of the jaws at their extremities than nearer the axis about which they move, and this occasions a certain amount of inconvenience when trying to hold a piece of metal with them without injuring the corners or surface. In this tool, however, parallelism of the jaws is maintained by a simple mechanical arrangement contained within the jaws themselves. In the pliers before me the surface grip of the jaws is ¾ in. by ⅛ in. at the extremities, and the jaws open to the extent of ⅛ in. Thus a firm, solid hold is effected on the object grasped, and from the nature of the mechanical construction of the pliers, the power applied is from twice to four times that of the force exerted by the old kind of pliers. It is true that pliers of this kind have been in use for some little time, but not so long as to be generally known and used. They are made in three sizes—namely, 4½ in., 5½ in., and 6½ in. in length. Sold respectively at 3s., 3s. 9d., and 5s. per pair.

22.—Circular-Saw Bench for Work-Bench and Driving-Wheel.

Maybe there is many a workman who desires, beyond all measure, to have a small circular saw for light work, but who has not a lathe which he can furnish with one or other of the circular-saw rigs described and illustrated in No. 1 (pages 8 and 9), or something similar. At all events, he has his work-bench, and on this he may easily place the handy little iron circular-saw bench figured in the accompanying illustration, cutting two or three holes in the top of the wood-bench, so that the saw itself may be actuated by the driving-wheel shown in the engraving (placed immediately below the illustration of the circular-saw bench) which is placed under the bench, and turned by means of the treadle.

The construction of the saw-table is apparent from the illustration in Fig. 6. It is made in halves, which are supported on the framing below, and which are removable, to allow of the easy removal or replacement of the saw when necessary. The fence is movable, and can be fixed at various distances from the saw, as may be required, by means of the thumb-screws, which pass through slots in pieces of metal projecting from the fence at right angles to it, and which work in projections from the frame which supports the table, being properly bored and cut with a screw-thread to receive the screws. The axle on which the saw revolves, is shown projecting from the frame, and secured by a hexagonal nut working on the screw-thread with which its end is furnished, as shown in the illustration.

The saw-table is 13 in. long by 7½ in. broad, and its upper surface is just 1½ in. above the level of the work-bench. The bottom of the frame projects beyond the face of the upper part, and is bolted to the work-bench. The saw is 6 in. in diameter, and projects 2 in. above the surface of the saw-table. The driving-wheel needs no description,

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as its construction is self-evident from the illustration given. The price of the saw-table, including saw, is £1 15s.; and that of the driving-wheel £1 10s.; or both are supplied together for £3 3s. The weight of the driving-wheel, it may be said, is 50 lbs., and can be used to drive any small bench lathe. Those who may desire to have the saw-table placed otherwise than on the work-bench can obtain it mounted on a strong and serviceable table or bench, which is 2ft. 10in. high, having a top 18 in. by 14 in. I must not omit to say that the iron saw-table is reversible, and can be reversed when required in a very short space of time. I have described the fence placed on one side for work parallel to the plane of the saw. On the other side are fences or flanges arranged at an angle of 45° for cutting mitres. Thus the whole affair is rendered of utility for a great variety of work, and will be prized by the workman who is engaged in light trades, such as picture-frame making, etc., as well as by the amateur.

The whole, indeed, may be said to form a very handy little appliance, well worthy of the attention of the amateur, and even of the professional workman, for carrying out such work as comes fairly within the capability of the circular saw with which it is furnished.

23.—New Adjustable Callipers.

To all callipers whose legs are drawn further apart or brought closer together by means of a screw, the chief objection has been the length of time that is taken up in working the screw, in order to bring the points of the legs into the required relative positions. A new and desirable make of callipers, however, has been recently introduced in which any delay of this kind is entirely obviated. The legs are fastened together by a steel stud at the top, and further connected by a strong steel spring, secured in place by wires or pins passing transversely through the legs, and which by its contraction causes extension of the legs to their utmost limit. At the distance of 1 inch from the stud that passes through both legs, and acts as a rivet to hold them together, are two more studs, one on each leg, projecting ⅜ in. beyond the surface of the side to which each is attached. In one of these a bar cut with a screw-thread for the greater part of its length is fixed by a pin with sufficient play to permit the end of the bar, which is about 2¾ in. long, to move freely in a plane parallel to the surfaces of the legs for about ⅛ in. Along the bar, when the legs are held tightly together, a broad piece of metal like a thick conical washer, and a steel tube with a broad milled flange at the outer end, move freely up and down. This steel tube is in reality an eccentric, which may be thrown out of, or brought into, gear with the screw-thread cut on the bar by a slight pressure on the milled flange. Thus supposing, for example, that the callipers are adjusted to take a measurement of ½ in. in diameter, and it is wished to increase the distance between the points to 2 in., all that need be done is to release the eccentric, allow the legs to fly apart under the extending power of the spring to the required distance as nearly as possible, and then to bring the eccentric and washer, as I may call it, in close contact with the stud through which the bar works, and finally regulate the distance required between the points with the utmost exactness by the aid of the eccentric, which falls into gear on the screw-thread as soon as it is brought into position and feels the pressure of the spring. The specimen pair of callipers before me opens to the extent of 5½ in., and costs 5s. Callipers of all shapes for inside and outside measurement are now made in this way, and are in every way preferable to ordinary callipers for the reason stated. The Editor.

*** The London Lathe and Tool Company write:—"In describing the Simultaneous Grip Chuck and the Independent Grip Chuck, we should perhaps have stated that these chucks are American." It was too late to note this in the description of the chucks in "Our Guide to Good Things" in No. 3, but the earliest opportunity has been taken of supplying the omission.

SHOP:

A Corner for Those who Want to Talk It.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

Building Construction.—G. C. (Kennington).—Every branch of the building trades will be treated in Work, not, perhaps, in a set series of lessons on the subject beginning with excavating and laying the foundations, and ending with the finishing touches imparted by the paperhanger and decorator; but in papers that will deal sufficiently and readably, if I may use the word, with various parts of the subject. Thus in Nos. 3 and 4 you will find chatty articles very much to the point and purpose on "A Simple Ceiling in Wood," which I am sure will be suggestive and helpful to many. In many of the Devonshire farmhouses there is nothing but the "planching," as the floor boards are called, between the rooms above and the rooms below. Note, please, how these very papers show how to make the joists themselves ornamental, and how to cover the chinks between the floor boards, and if it is desired, to stop as far as possible the transmission of sound from one room to another. Suppose you write again and afford some tangible idea of the "series of lessons" for which you seem to wish.

Wood Carving.—E. B. (Eton).—I fear it is not possible to give the interesting little pamphlet you kindly send in Work. It would serve as introductory matter to a study in wood carving, and as a series of remarks advocating the adoption of this art either as a trade or as a hobby. Why could not a skilled carver, as you appear to be, send in some studies in wood carving, with matter descriptive of the method to be followed in producing the effects depicted by the drawings?

Keys for Pianos, Organs, and Harmoniums.—G. D. (Upper Holloway).—Certainly your request shall be complied with whenever opportunity offers, and the subject of building these instruments is sure to come to the surface in Work ere long. Meanwhile, why not advertise in our pages? There is nothing like advertising for nursing, helping, and making a business in the present day. Success, be it what it may, must be purchased by preliminary sacrifice. Even omelets, you know, cannot be made without breaking eggs.

Photography and Fretwork.—D. H. (Wandsworth).—See replies in respect to papers on the first-named subject in No. 3. With regard to the second, why not send in specimens of your work if you are a designer of fretwork patterns? I have on my staff very efficient writers on fret cutting.

Photography and Saddlery.—A. H. (Theale).—You will see what I have said above about papers on photography. With reference to the second subject please write again, giving more definite information and proposed mode of treatment, as it is now under consideration as one to be dealt with at no very distant time.

Wire Thread Fret Saw.—G. C. (Nunhead) writes:—"It is really a singular fact that there is nothing new under the sun. In your admirable little welcome arrival, Work, I see you notice a 'New Wire Thread Fret Saw.' Perhaps you will be surprised to hear that the Chinese fret workers and the jade stone ornament makers of Canton use precisely the same wire jagged or tooth saw for their work, and have done so from time immemorial. I have seen these skilled ingenious workers plying their trades many times, and as far back as the year 1872."—[I am much obliged to you for the interesting nature of your communication, and so, doubtless, will be many of the readers of Work. It is true that there is nothing new under the sun, but there is a time when anything and everything under the sun must be new to the person who comes across it for the first time. Thus the wire thread saw was new to me, and will be new to many besides myself.—Ed.]

Wire Thread Fret Saw.—G. D. (Rhayader) writes:—"Your new Wire Thread Fret Saw is not a new thing. I have seen it used twenty-five years ago."—[Will you kindly write again and tell me for what purpose it was used—if for fret cutting, and under what circumstances? Also in what sizes it was made, and if it was an article commonly and constantly on sale.—Ed.]

Our Advertising Pages.—L. S. L. (Kirkcaldy).—These in no way impair the utility of Work, but, on the contrary, add to it. Your suggestion, however, shall be noted. Every suggestion, indeed, I may say, is carefully considered. If you will send in the article you name in your letter, on approval, it will be read with a view to acceptance, if suitable.

Theory and Practice.—W. B. B. (Brannox Town).—The title was very carefully considered; and although it may seem to you that Theory should precede Practice, the arrangement of the words was made purposely, because, although both Practice and Theory will find a place in the Magazine, there will be more of the former than of the latter.

*** *Many answers are held over for want of space.*

Trade Notes and Memoranda.

Some Topics of the Hour.—Professional differences as to Quantities.—Wall Papers.—Fireproof Construction.—The Dangers to Health of Stoves.

Notes.—Hastings wants a harbour at a cost of £60,000.—The Department of Science and Art will hold Examinations from May 6th to 31st.—The new Post Office for Birmingham will cost £70,000.—Filtering of sewage is being successfully experimented in at Acton.

Littlestone-on-Sea, between Dungeness and Folkestone, is to become a new Sussex watering-place.

The charge for ascending to the top of the Eiffel Tower is to be 5 francs; for ascending to the second platform, which is 700 feet high, 3 francs; and 2 francs to the first platform, 200 feet high. Visitors can use the lifts or walk upstairs.

The new Berlin Cathedral will cover 7,053 square metres, or 900 more than Cologne Cathedral. The building will cost 22 million marks, and contain room for about 2,500 persons.

The Metropolitan Police Receiver invites tenders for 11,500 pairs of boots, due August 1, 1889; and 13,000 pairs, due February 1, 1890.

The Spiral Wood-Cutting Company (Limited) has lately been registered. Capital £1,500, divided into 1,500 shares of £1 each. Objects: To acquire letters patent of an invention of a new and improved tool for spiral turning, and to carry on the business of spiral turning in wood of every description.

Parcels not weighing more than 7 lbs. can now be sent to Mauritius by the parcel post at a minimum charge of 3s. 2d.

Of the suburban bridges freed in recent years, Kingston cost £15,600; Walton. £7,012 (the amount of the claim being £29,510); Staines, £20,125 (the amount of the claim being £80,500); Kew, £57,300 (the claim being £73,832); Hampton Court, £48,048 (the claim being £61,600); Tottenham Mills, £1,750 (the claim being £7,245); Hellyer's Ferry, £1,568; Chingford Ferry, £4,082.

It is proposed that the sum of £2,000 per annum for two years be given out of the City's cash in aid of the objects of the City and Guilds of London Institute, for the advancement of Technical Education, the first payment to be made forthwith, and the second payment on January 1st, 1890.

The City of London School Committee intend to ascertain how best the space at their disposal can be utilised for the erection of a building suitable for the education of boys in carpentering and other useful pursuits.

An artistic piece of wall decoration has been completed in the Nurses' Refectory, Guy's Hospital. It is the work of Mr. H. J. Draper, who in 1886 gained the Royal Academy students' prize of £40 offered for a design for the decoration of a public building.

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Small prepaid Advertisements, such as Situations Wanted, Exchange, etc., Twenty Words or less, One Shilling, and One Penny per Word extra if over Twenty.

Brass Door Plate, 9 in. by 4½ in., free, 4s. 6d. See Specimens and Testimonials.—Gilkes' Engraving Works, Reading.

Rubber Stamps.—All who wish to make, buy, or sell. Proofs, quotations, and price lists free.—Prestridge, Manufacturer, Bristol. [1 R

Microscopes and Objects.—Slides for Exhibiting from 5s. dozen. Microscopes and all requisites. List.—Henry Ebbage, 344, Caledonian Road, London. [2 R

Twenty Fretwork Patterns, free, 6d. Swiss Saws, 1s. 1d. per gross, free. Fretwork Instructions, Tool and Pattern Lists, with specimen design, gratis. Post card inquiry sufficient.—Ellicott, Launceston. [1 S

Patterns.—100 Fretwork, 200 Turning, 300 Stencils, 1s. each parcel, free. Obtain commission by introducing lists.—Collins, Summerlay's Place, Bath. [2 S

Banjos, Fittings, Strings, and every requisite supplied. Stamp for list.—Winder, banjo specialist, 16, Jeffreys Street, Kentish Town Road, London, N.W. [3 S

Electric Alarm Clock, rings the electric bell at any hour until stopped; price complete, 16s., carriage paid. Electric bells, 3s.; particulars free.—Barnett and Co., 21, Brighton Grove, Newcastle-on-Tyne. [4 S

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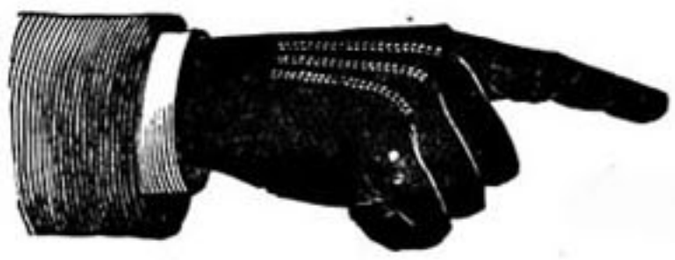

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